

STATE OF NEW HAMPSHIRE INTER-DEPARTMENT COMMUNICATION

DATE: May 25, 2021

FROM: Andrew O'Sullivan
Wetlands Program Manager

AT (OFFICE): Department of
Transportation

SUBJECT Dredge & Fill Application
Bow, 42704

Bureau of
Environment

TO Karl Benedict, Public Works Permitting Officer
New Hampshire Wetlands Bureau
29 Hazen Drive, P.O. Box 95
Concord, NH 03302-0095

Forwarded herewith is the application package prepared by NH DOT Bureau of Highway Design for the subject major impact project. This project is classified as major per Env-Wt 407.03(a). This project will rehabilitate two corrugated metal pipes (cmp) installed under I-89 constructed in 1958. Location 1 is a 292' long 48" cmp carrying an unnamed tier 1 stream underneath I-89 at 840' west of I-93. Location 2 is a 223' long 18" cmp carrying local runoff underneath I-89 at 225' west of I-93. Both locations are severely rusted with voids at their inverts, with location 1 having holes in the upper sides of the pipe and a perched outlet. The proposed design is a cured in-place liner for the 48" cmp and slip lining the 18" cmp with a 12" minimum diameter pipe liner.

This project was reviewed at the February 17, 2021 Natural Resource Agency Coordination Meetings. A copy of the minutes has been included with this application package. A copy of this application and plans can be accessed on the Departments website via the following link:
<http://www.nh.gov/dot/org/projectdevelopment/environment/units/program-management/wetland-applications.htm>

NHDOT anticipates and requests that this project be reviewed and permitted by the Army Corp of Engineers through the State Programmatic General Permit process. A copy of the application has been sent to the Army Corp of Engineers.

No mitigation is required.

The lead people to contact for this project are Kirk Mudgett, Bureau of Highway Maintenance (271-2731 or Kirk.Mudgett@dot.nh.gov) or Sarah Large, Wetlands Program Analyst, Bureau of Environment (271-3226 or Sarah.Large@dot.nh.gov).

A payment voucher has been processed for this application (Voucher #646650) in the amount of \$1,863.60

If and when this application meets with the approval of the Bureau, please send the permit directly to Andrew O'Sullivan, Wetlands Program Manager, Bureau of Environment.

AMO:sel
Enclosures

cc:
BOE Original
Town of Bow (4 copies via certified mail)
Upper Merrimack River Local Advisory Committee (via certified mail)
David Trubey, NH Division of Historic Resources (Cultural Review Within)
Bureau of Construction (via electronic notification)
Carol Henderson, NH Fish & Game (via electronic notification)
Maria Tur, US Fish & Wildlife (via electronic notification)
Mark Kern, US Environmental Protection Agency (via electronic notification)
Michael Hicks, US Army Corp of Engineers (via electronic notification)
Kevin Nyhan, BOE (via electronic notification)



**STANDARD DREDGE AND FILL
WETLANDS PERMIT APPLICATION**
Water Division/Land Resources Management
Wetlands Bureau
Check the Status of your Application



RSA/Rule: RSA 482-A/Env-Wt 100-900

APPLICANT'S NAME: NH Department of Transportation **TOWN NAME:** Bow

Administrative Use Only	Administrative Use Only	Administrative Use Only	File No.:
			Check No.:
			Amount:
			Initials:

A person may request a waiver of the requirements in Rules Env-Wt 100-900 to accommodate situations where strict adherence to the requirements would not be in the best interest of the public or the environment but is still in compliance with RSA 482-A. A person may also request a waiver of the standards for existing dwellings over water pursuant to RSA 482-A:26, III(b). For more information, please consult the [Waiver Request Form](#).

SECTION 1 - REQUIRED PLANNING FOR ALL PROJECTS (Env-Wt 306.05; RSA 482-A:3, I(d)(2))	
Please use the Wetland Permit Planning Tool (WPPT) , the Natural Heritage Bureau (NHB) DataCheck Tool , the Aquatic Restoration Mapper , or other sources to assist in identifying key features such as: <u>priority resource areas (PRAs)</u> , <u>protected species or habitats</u> , coastal areas, designated rivers, or designated prime wetlands.	
Has the required planning been completed?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Does the property contain a PRA? If yes, provide the following information:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<ul style="list-style-type: none"> • Does the project qualify for an Impact Classification Adjustment (e.g. NH Fish and Game Department (NHF&G) and NHB agreement for a classification downgrade) or a Project-Type Exception (e.g. Maintenance or Statutory Permit-by-Notification (SPN) project)? See Env-Wt 407.02 and Env-Wt 407.04. 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<ul style="list-style-type: none"> • Protected species or habitat? <ul style="list-style-type: none"> ○ If yes, species or habitat name(s): Spotted turtle, wood turtle ○ NHB Project ID #: 20-3283 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
• Bog?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
• Floodplain wetland contiguous to a tier 3 or higher watercourse?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
• Designated prime wetland or duly-established 100-foot buffer?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
• Sand dune, tidal wetland, tidal water, or undeveloped tidal buffer zone?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Is the property within a Designated River corridor? If yes, provide the following information:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<ul style="list-style-type: none"> • Name of Local River Management Advisory Committee (LAC): Upper Merrimack River Local Advisory Committee 	

irm@des.nh.gov or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

www.des.nh.gov

<ul style="list-style-type: none"> A copy of the application was sent to the LAC on Month: <input type="text"/> Day: <input type="text"/> Year: <input type="text"/> 	
For dredging projects, is the subject property contaminated? <ul style="list-style-type: none"> If yes, list contaminant: <input type="text"/> 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Is there potential to impact impaired waters, class A waters, or outstanding resource waters?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
For stream crossing projects, provide watershed size (see <u>WPPT</u> or Stream Stats): Streamstats 115 AC (not used) LIDAR 144.4 AC	
SECTION 2 - PROJECT DESCRIPTION (Env-Wt 311.04(i)) Provide a brief description of the project and the purpose of the project, outlining the scope of work to be performed and whether impacts are temporary or permanent. DO NOT reply "See attached"; please use the space provided below.	
<p>This project will rehabilitate two corrugated metal pipes (cmp) installed under I-89 constructed in 1958. Location 1 is a 292' long 48" cmp carrying an unnamed tier 1 stream underneath I-89 at 840' west of I-93. Location 2 is a 223' long 18" cmp carrying local runoff underneath I-89 at 225' west of I-93. Both locations are severely rusted with voids at their inverts, with location 1 having holes in the upper sides of the pipe and a perched outlet. The proposed design is a cured in-place liner for the 48" cmp and slip lining the 18" cmp with a 12" minimum diameter pipe liner. Incidental work will include the repair of the 48" inlet headwall (reset missing stones, re-point mortar joints) and resetting riprap / replacing missing stones at the 48" pipe outlet to eliminate the perch.</p>	
SECTION 3 - PROJECT LOCATION Separate wetland permit applications must be submitted for each municipality within which wetland impacts occur.	
ADDRESS: Culverts crossing under I-89 at 840' and 225' west of I-93	
TOWN/CITY: BOW	
TAX MAP/BLOCK/LOT/UNIT: N/A	
US GEOLOGICAL SURVEY (USGS) TOPO MAP WATERBODY NAME: both crossings are tributaries to the Turkey River <input type="checkbox"/> N/A	
(Optional) LATITUDE/LONGITUDE in decimal degrees (to five decimal places): 43.1688,° North	

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-71.5324° West		
SECTION 4 - APPLICANT (DESIRED PERMIT HOLDER) INFORMATION (Env-Wt 311.04(a))		
If the applicant is a trust or a company, then complete with the trust or company information.		
NAME: NH Dept. of Transportation		
MAILING ADDRESS: PO Box 483		
TOWN/CITY: Concord	STATE: NH	ZIP CODE: 03303
EMAIL ADDRESS: Kirk.O.Mudgett@dot.nh.gov		
FAX: [REDACTED]	PHONE: 603-271-1598	
ELECTRONIC COMMUNICATION: By initialing here: KOM, I hereby authorize NHDES to communicate all matters relative to this application electronically.		
SECTION 5 - AUTHORIZED AGENT INFORMATION (Env-Wt 311.04(c))		
<input type="checkbox"/> N/A		
LAST NAME, FIRST NAME, M.I.: [REDACTED]		
COMPANY NAME: [REDACTED]		
MAILING ADDRESS: [REDACTED]		
TOWN/CITY: [REDACTED]	STATE: [REDACTED]	ZIP CODE: [REDACTED]
EMAIL ADDRESS: [REDACTED]		
FAX: [REDACTED]	PHONE: [REDACTED]	
ELECTRONIC COMMUNICATION: By initialing here [REDACTED], I hereby authorize NHDES to communicate all matters relative to this application electronically.		
SECTION 6 - PROPERTY OWNER INFORMATION (IF DIFFERENT THAN APPLICANT) (Env-Wt 311.04(b))		
If the owner is a trust or a company, then complete with the trust or company information.		
<input checked="" type="checkbox"/> Same as applicant		
NAME: [REDACTED]		
MAILING ADDRESS: [REDACTED]		
TOWN/CITY: [REDACTED]	STATE: [REDACTED]	ZIP CODE: [REDACTED]
EMAIL ADDRESS: Andrew.M.OSullivan@dot.nh.gov		
FAX: [REDACTED]	PHONE: 603-271-3226	
ELECTRONIC COMMUNICATION: By initialing here AMO, I hereby authorize NHDES to communicate all matters relative to this application electronically.		

SECTION 7 - RESOURCE-SPECIFIC CRITERIA ESTABLISHED IN Env-Wt 400, Env-Wt 500, Env-Wt 600, Env-Wt 700, OR Env-Wt 900 HAVE BEEN MET (Env-Wt 313.01(a)(3))

Describe how the resource-specific criteria have been met for each chapter listed above (please attach information about stream crossings, coastal resources, prime wetlands, or non-tidal wetlands and surface waters):
 In accordance with Env-Wt 400 the jurisdictional areas within the project limits have been delineated by Justin Sherman and Diane DeVrise with Stoney Ridge Environmental, LLC on December 4, 2020 and February 4, 2021. The jurisdictional areas are referenced within the included wetlands impact plans and wetlands delineation report. The project has been designed in accordance with Env-Wt 527, and Env-Wt 900 to the maximum extent practicable. The application includes a supplemental narrative detailing the project purpose and need, resources, alternatives, impacts, and hydraulic information necessary to address Env-Wt 904.08 - Rehabilitation of Tier 1 stream crossings. Unavoidable impacts to wetlands have been minimized to the maximum extent practicable. Project specific information is contained within this permit application.

SECTION 8 - AVOIDANCE AND MINIMIZATION

Impacts within wetland jurisdiction must be avoided to the maximum extent-practicable (Env-Wt 313.03(a)).* Any project with unavoidable jurisdictional impacts must then be minimized as described in the Wetlands Best Management Practice Techniques For Avoidance and Minimization and the Wetlands Permitting: Avoidance, Minimization and Mitigation Fact Sheet. For minor or major projects, a functional assessment of all wetlands on the project site is required (Env-Wt 311.03(b)(10)).*

Please refer to the application checklist to ensure you have attached all documents related to avoidance and minimization, as well as functional assessment (where applicable). Use the Avoidance and Minimization Checklist, the Avoidance and Minimization Narrative, or your own avoidance and minimization narrative.

*See Env-Wt 311.03(b)(6) and Env-Wt 311.03(b)(10) for shoreline structure exemptions.

SECTION 9 - MITIGATION REQUIREMENT (Env-Wt 311.02)

If unavoidable jurisdictional impacts require mitigation, a mitigation pre-application meeting must occur at least 30 days but not more than 90 days prior to submitting this Standard Dredge and Fill Permit Application.

Mitigation Pre-Application Meeting Date: Month: 2 Day: 17 Year: 2021

N/A - Mitigation is not required

SECTION 10 - THE PROJECT MEETS COMPENSATORY MITIGATION REQUIREMENTS (Env-Wt 313.01(a)(1)c)

Confirm that you have submitted a compensatory mitigation proposal that meets the requirements of Env-Wt 800 for all permanent unavoidable impacts that will remain after avoidance and minimization techniques have been exercised to the maximum extent practicable: I confirm submittal.

N/A – Compensatory mitigation is not required

SECTION 11 - IMPACT AREA (Env-Wt 311.04(g))

For each jurisdictional area that will be/has been impacted, provide square feet (SF) and, if applicable, linear feet (LF) of impact, and note whether the impact is after-the-fact (ATF; i.e., work was started or completed without a permit).

For intermittent and ephemeral streams, the linear footage of impact is measured along the thread of the channel. *Please note, installation of a stream crossing in an ephemeral stream may be undertaken without a permit per Rule Env-Wt 309.02(d), however other dredge or fill impacts should be included below.*

For perennial streams/ivers, the linear footage of impact is calculated by summing the lengths of disturbances to the channel and banks.

Permanent impacts are impacts that will remain after the project is complete (e.g., changes in grade or surface materials).

Temporary impacts are impacts not intended to remain (and will be restored to pre-construction conditions) after the project is completed.

JURISDICTIONAL AREA		PERMANENT			TEMPORARY		
		SF	LF	ATF	SF	LF	ATF
Wetlands	Forested Wetland			<input type="checkbox"/>			<input type="checkbox"/>
	Scrub-shrub Wetland			<input type="checkbox"/>	909		<input type="checkbox"/>
	Emergent Wetland			<input type="checkbox"/>	1420		<input type="checkbox"/>
	Wet Meadow			<input type="checkbox"/>			<input type="checkbox"/>
	Vernal Pool			<input type="checkbox"/>			<input type="checkbox"/>
	Designated Prime Wetland			<input type="checkbox"/>			<input type="checkbox"/>
	Duly-established 100-foot Prime Wetland Buffer			<input type="checkbox"/>			<input type="checkbox"/>
Surface Water	Intermittent / Ephemeral Stream			<input type="checkbox"/>	228	47	<input type="checkbox"/>
	Perennial Stream or River			<input type="checkbox"/>	1227	119	<input type="checkbox"/>
	Lake / Pond			<input type="checkbox"/>			<input type="checkbox"/>
	Docking - Lake / Pond			<input type="checkbox"/>			<input type="checkbox"/>
	Docking - River			<input type="checkbox"/>			<input type="checkbox"/>
Banks	Bank - Intermittent Stream			<input type="checkbox"/>			<input type="checkbox"/>
	Bank - Perennial Stream / River			<input type="checkbox"/>	875	125	<input type="checkbox"/>
	Bank / Shoreline - Lake / Pond			<input type="checkbox"/>			<input type="checkbox"/>
Tidal	Tidal Waters			<input type="checkbox"/>			<input type="checkbox"/>
	Tidal Marsh			<input type="checkbox"/>			<input type="checkbox"/>
	Sand Dune			<input type="checkbox"/>			<input type="checkbox"/>
	Undeveloped Tidal Buffer Zone (TBZ)			<input type="checkbox"/>			<input type="checkbox"/>
	Previously-developed TBZ			<input type="checkbox"/>			<input type="checkbox"/>
	Docking - Tidal Water			<input type="checkbox"/>			<input type="checkbox"/>
TOTAL					4659	291	

SECTION 12 - APPLICATION FEE (RSA 482-A:3, I)

<input type="checkbox"/> MINIMUM IMPACT FEE: Flat fee of \$400.		
<input type="checkbox"/> NON-ENFORCEMENT RELATED, PUBLICLY-FUNDED AND SUPERVISED RESTORATION PROJECTS, REGARDLESS OF IMPACT CLASSIFICATION: Flat fee of \$400 (refer to RSA 482-A:3, 1(c) for restrictions).		
<input checked="" type="checkbox"/> MINOR OR MAJOR IMPACT FEE: Calculate using the table below:		
Permanent and temporary (non-docking): 4659 SF	× \$0.40 = \$	1863.60
Seasonal docking structure: SF	× \$2.00 = \$	SF
Permanent docking structure: SF	× \$4.00 = \$	SF
Projects proposing shoreline structures (including docks) add \$400 = \$ SF		
Total = \$		
1863.60		

The application fee for minor or major impact is the above calculated total or \$400, whichever is greater = \$ 1863.60

SECTION 13 - PROJECT CLASSIFICATION (Env-Wt 306.05)
 Indicate the project classification.

Minimum Impact Project Minor Project Major Project

SECTION 14 - REQUIRED CERTIFICATIONS (Env-Wt 311.11)

Initial each box below to certify:

Initials: KOM
 To the best of the signer's knowledge and belief, all required notifications have been provided.

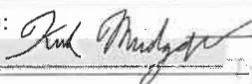
Initials: KOM
 The information submitted on or with the application is true, complete, and not misleading to the best of the signer's knowledge and belief.

Initials: KOM
 The signer understands that:

- The submission of false, incomplete, or misleading information constitutes grounds for NHDES to:
 - Deny the application.
 - Revoke any approval that is granted based on the information.
 - If the signer is a certified wetland scientist, licensed surveyor, or professional engineer licensed to practice in New Hampshire, refer the matter to the joint board of licensure and certification established by RSA 310-A:1.
- The signer is subject to the penalties specified in New Hampshire law for falsification in official matters, currently RSA 641.
- The signature shall constitute authorization for the municipal conservation commission and the Department to inspect the site of the proposed project, except for minimum impact forestry SPN projects and minimum impact trail projects, where the signature shall authorize only the Department to inspect the site pursuant to RSA 482-A:6, II.

Initials: KOM
 If the applicant is not the owner of the property, each property owner signature shall constitute certification by the signer that he or she is aware of the application being filed and does not object to the filing.

SECTION 15 - REQUIRED SIGNATURES (Env-Wt 311.04(d); Env-Wt 311.11)

SIGNATURE (OWNER): 	PRINT NAME LEGIBLY: Kirk Mudgett	DATE: 5-12-21
SIGNATURE (APPLICANT, IF DIFFERENT FROM OWNER):	PRINT NAME LEGIBLY:	DATE:
SIGNATURE (AGENT, IF APPLICABLE):	PRINT NAME LEGIBLY:	DATE:

SECTION 16 - TOWN / CITY CLERK SIGNATURE (Env-Wt 311.04(f))

As required by RSA 482-A:3, I(a)(1), I hereby certify that the applicant has filed four application forms, four detailed plans, and four USGS location maps with the town/city indicated below.

TOWN/CITY CLERK SIGNATURE:	PRINT NAME LEGIBLY: State agency exempt per RSA 482-A:3,I(a)
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TOWN/CITY: 4 copies via cert. mail	DATE: exempt per Env-Wt 311.05(a)(14)
------------------------------------	---------------------------------------

DIRECTIONS FOR TOWN/CITY CLERK:

Per RSA 482-A:3, I(a)(1)

1. IMMEDIATELY sign the original application form and four copies in the signature space provided above.
2. Return the signed original application form and attachments to the applicant so that the applicant may submit the application form and attachments to NHDES by mail or hand delivery.
3. IMMEDIATELY distribute a copy of the application with one complete set of attachments to each of the following bodies: the municipal Conservation Commission, the local governing body (Board of Selectmen or Town/City Council), and the Planning Board.
4. Retain one copy of the application form and one complete set of attachments and make them reasonably accessible for public review.

DIRECTIONS FOR APPLICANT:

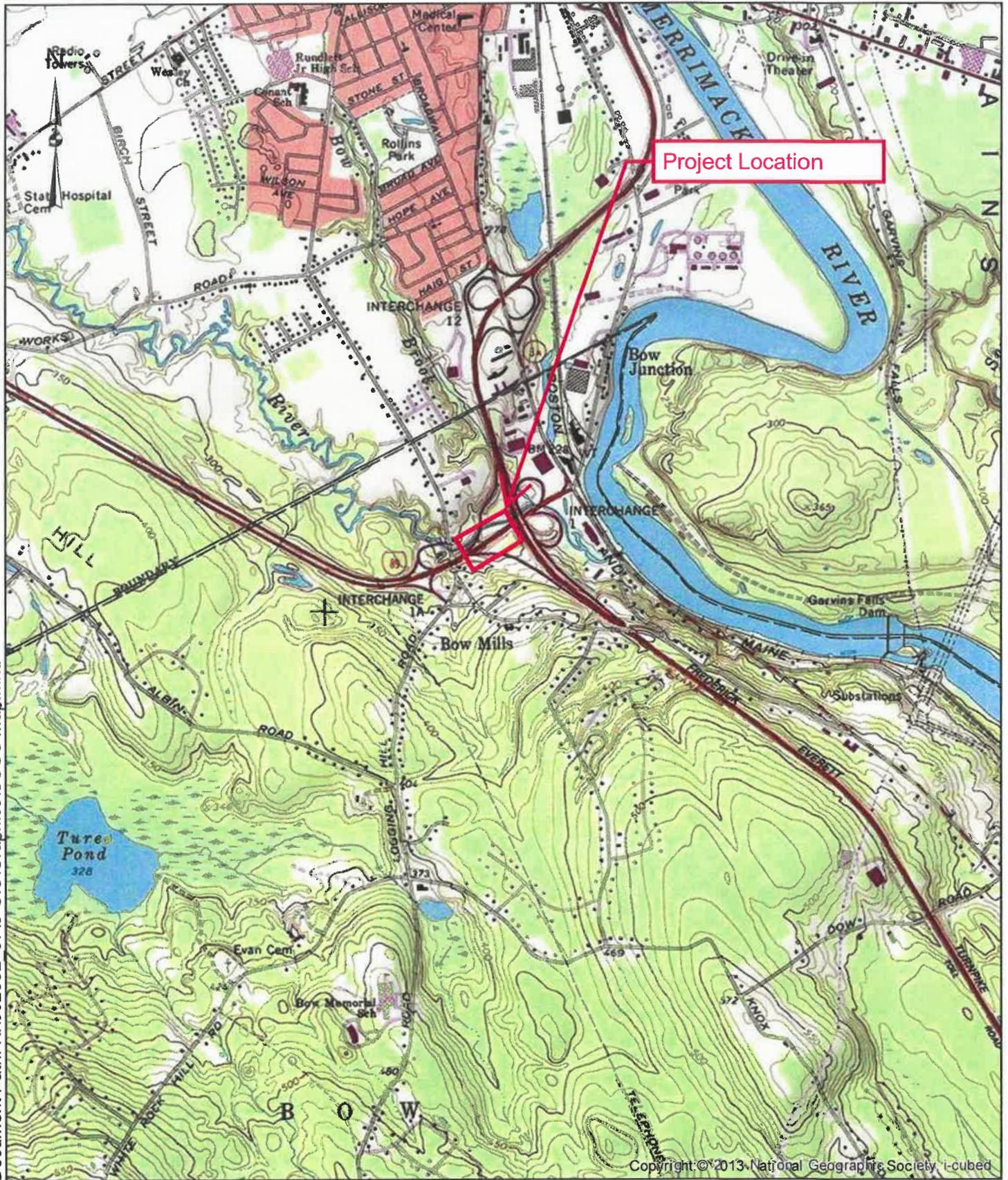
Submit the original permit application form bearing the signature of the Town/City Clerk, additional materials, and the application fee to NHDES by mail or hand delivery at the address at the bottom of this page. Make check or money order payable to "Treasurer – State of NH".

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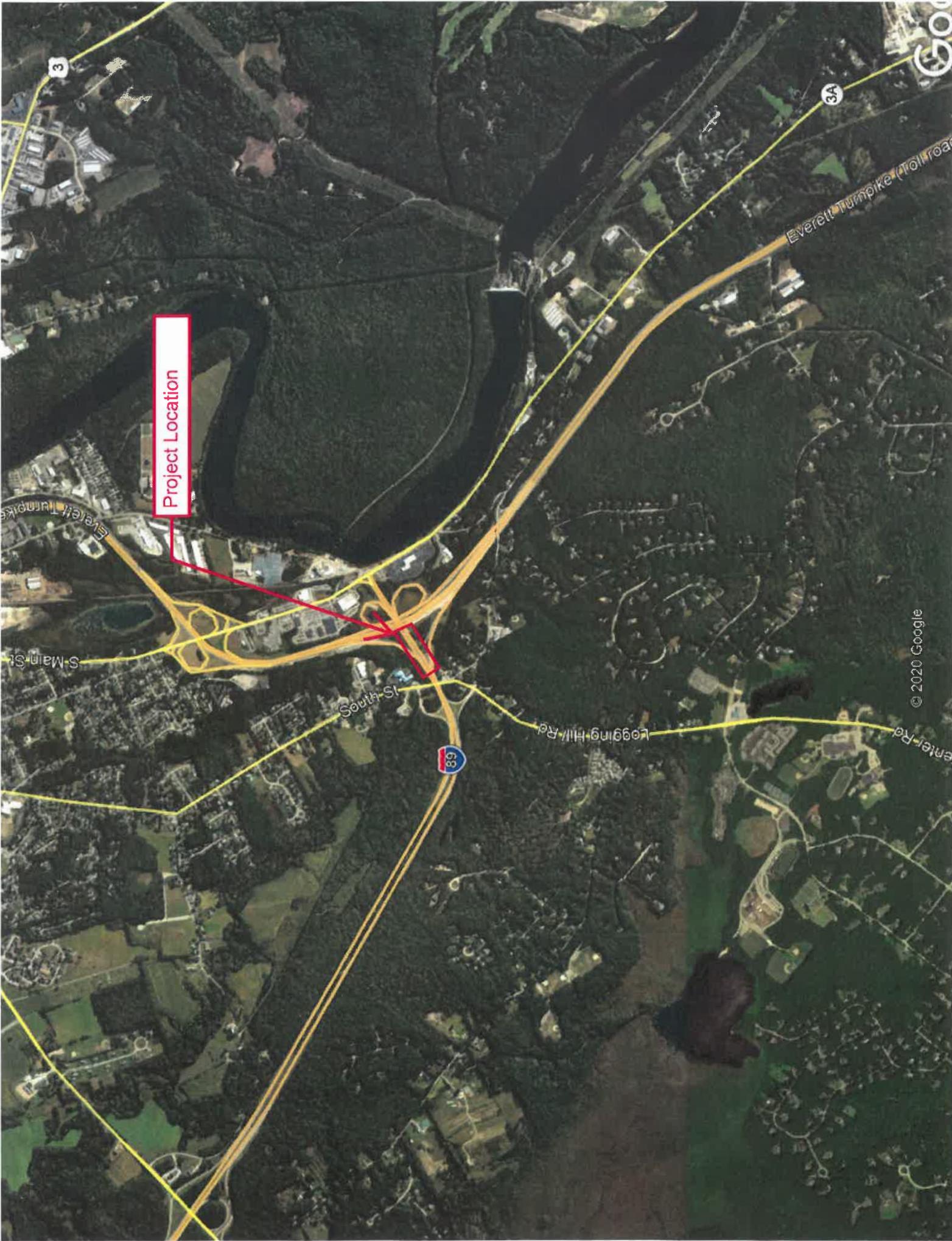
www.des.nh.gov

Document Path: K:\092592_0713-GIS\Graphics\USGS Map.mxd



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		BOW #42704 CULVERT MAINTENANCE/REPAIRS I-89 NB AND SB TRAVEL LANES		EXHIBIT
		150 Dow Street Manchester, NH 03101-1227 Tel 603-669-5555 Fax 603-669-4168 Web Page www.hoyletanner.com		A
DR. BY dcoon	DATE 10/30/2020	SCALE 1 inch = 2,000 feet		PROJECT LOCATION MAP



Project Location

3

3A

Everett Turnpike (Toll road)

Everett Turnpike

S Main St

South 1st

89

Logging Hill Rd

Center Rd

© 2020 Google

Bow 42704 Tax Map





STANDARD DREDGE AND FILL
WETLANDS PERMIT APPLICATION
ATTACHMENT A: MINOR AND MAJOR PROJECTS



Water Division/Land Resources Management
Wetlands Bureau

Check the Status of your Application

RSA/ Rule: RSA 482-A/ Env-Wt 311.10; Env-Wt 313.01(a)(1); Env-Wt 313.03

APPLICANT'S NAME: NH Dept. of Transportation **TOWN NAME:** Bow

Attachment A is required for *all minor and major projects*, and must be completed *in addition* to the Avoidance and Minimization Narrative or Checklist that is required by Env-Wt 307.11.

For projects involving construction or modification of non-tidal shoreline structures over areas of surface waters having an absence of wetland vegetation, only Sections I.X through I.XV are required to be completed.

PART I: AVOIDANCE AND MINIMIZATION

In accordance with Env-Wt 313.03(a), the Department shall not approve any alteration of any jurisdictional area unless the applicant demonstrates that the potential impacts to jurisdictional areas have been avoided to the maximum extent practicable and that any unavoidable impacts have been minimized, as described in the Wetlands Best Management Practice Techniques For Avoidance and Minimization.

SECTION I.I - ALTERNATIVES (Env-Wt 313.03(b)(1))

Describe how there is no practicable alternative that would have a less adverse impact on the area and environments under the Department's jurisdiction.

TO REPLACE THE 48" CORRUGATED METAL PIPE WITH A CROSSING DESIGNED TO THE UNH STREAM CROSSING GUIDELINES AND ROSGEN CLASSIFICATION, IT WOULD REQUIRE A 10' SPAN PRECAST BOX CULVERT ON A NEW ALIGNMENT. THE BOX CULVERT WOULD HAVE TO BE CONSTRUCTED AT LEAST 20' AWAY FROM THE 48" CMP SO THE EXISTING CULVERT COULD BE USED TO MAINTAIN EXISTING STREAM FLOW. CONSTRUCTION OF THE BOX CULVERT WOULD HAVE TO BE A PHASED CONSTRUCTION OPEN CUT, CREATING MAJOR IMPACTS TO TRAFFIC PATTERNS, AND REQUIRING TEMPORARY WIDENINGS AND MULTIPLE COFFERDAMS. THE COST OF THIS OPTION IS ESTIMATED AT \$3.95 MILLION, NOT INCLUDING DESIGN, ROW ACQUISITIONS, PERMITTING, REIMBURSABLE UTILITY IMPACTS, AND RECONSTRUCTION OF PORTIONS OF THE SB OFF RAMP TO I-93 AND THE RECREATIONAL TRAIL.

A HYDRAULICALLY SIZED 54" CONCRETE PIPE WAS ALSO CONSIDERED. DUE TO THE AMOUNT OF HIGHWAY AND UTILITY INFRASTRUCTURE AND TRAFFIC VOLUMES, THIS CULVERT WOULD LIKELY BE CONSTRUCTED BY TUNNELING OR BORE & JACK, SIMILAR TO THE I-393 CULVERT REPLACEMENTS COMPLETED A FEW YEARS AGO. THE CULVERT WOULD HAVE TO BE CONSTRUCTED AT LEAST 20' AWAY FROM THE 48" CMP SO THE THE EXISTING CULVERT COULD BE USED TO MAINTAIN EXISTING STREAM FLOW. ACCESS AND STAGING AREAS FOR THIS TYPE OF CONSTRUCTION WOULD REQUIRE LARGE STAGING AREAS WITH SIGNIFICANT TEMPORARY WETLAND IMPACTS. THE COST FOR THIS OPTION IS ESTIMATED AT \$1.4 MILLION, BASED ON PRO-RATED COSTS FROM A RECENT I-393 CULVERT REPLACEMENT PROJECT,

NEITHER OF THESE OPTIONS MEETS THE PROJECT OBJECTIVE OF A TIMELY AND COST EFFECTIVE REHABILITATION THAT MINIMIZES IMPACTS TO THE ENVIRONMENT AND THE PUBLIC AND UNDER THE CONSTRAINTS OF THIS SITE. ALL IMPACTS FOR THE PROPOSED DESIGN ARE TEMPORARY.

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SECTION I.II - MARSHES (Env-Wt 313.03(b)(2))

Describe how the project avoids and minimizes impacts to tidal marshes and non-tidal marshes where documented to provide sources of nutrients for finfish, crustacean, shellfish, and wildlife of significant value.

Wetland #6 (PEM1F), the ponded area at the 18" pipe inlet, would be considered a marsh, however it is a very low quality marsh, with invasives and potential nutrient/pollutant contamination from the highway.

This wetland is identified as B3 in the Wetland Delineation and Assessment Report attached later in the application.

Impacts to this wetland are minimized to the maximum extent practical by selection of the proposed rehabilitation option, which has less impacts than replacement alternatives. All impacts to the wetlands are temporary.

SECTION I.III - HYDROLOGIC CONNECTION (Env-Wt 313.03(b)(3))

Describe how the project maintains hydrologic connections between adjacent wetland or stream systems.

The existing 48" cmp (location 1) provides a hydrologic connection between the intermittent stream and the Turkey River. The proposed cured in place liner is less than 1" thick and will conform to the existing corrugations of the 48" cmp resulting in a minimal elevation change at the inlet and outlet and similar flow conditions for a range of flows. There is no perch at the inlet. There is a significant perch at the outlet when water level in the Turkey river is low. The outlet perch will be corrected by trimming the 48" outlet to match the existing river bank and resetting stones under and around the pipe outlet to make a level and even bank. There will be no permanent impacts to the existing wetlands and/or the stream. The 48" cmp rehabilitation will maintain or enhance connectivity.

The existing 18" cmp (location 2) provides a hydrologic connection between a locally ponded area that accepts local runoff to the Turkey River. There is no perch at the inlet or outlet. The proposed liner will be 12" diameter, with the liner invert about 1" higher than the existing invert. The 12" diameter liner will not have a significant effect on capacity, velocity, or flow conditions through the crossing at a range of flows. The 18" cmp rehabilitation will maintain the hydrologic connection between the ponded area and the Turkey River.

SECTION I.IV - JURISDICTIONAL IMPACTS (Env-Wt 313.03(b)(4))

Describe how the project avoids and minimizes impacts to wetlands and other areas of jurisdiction under RSA 482-A, especially those in which there are exemplary natural communities, vernal pools, protected species and habitat, documented fisheries, and habitat and reproduction areas for species of concern, or any combination thereof.

The project has been designed in accordance with ENV-Wt 400, 500, and 900. Unavoidable impacts to wetlands have been minimized to the maximum extent practicable; the Department has addressed Env-Wt 311.07 Avoidance and Minimization through the checklist document included with this application

The resources present within the project area at location 1 are: intermittent stream, palustrine wetlands at the inlet, and the Turkey River at the outlet. At location 2 the resources present are a ponded palustrine wetland at the inlet, and the Turkey River at the outlet.

The project area is within the range of the northern long eared bat (NLEB) which is listed as a threatened species under the Federal Endangered Species Act. The US Fish and Wildlife Service (USFWS) Information for Planning and Conservation webtool was used to determine that the project qualifies for January 5, 2016 FHWA Programmatic Biological Opinion on Final 4(d) Rule for the NLEB and Activities Excepted from Take Prohibitions. The USFWS has concurred that the project may affect NLEB, however, any take that may occur as a result of the proposed project is not prohibited by ESA Section 4(d) Rule adopted for this species. All appropriate Avoidance and Minimization Measures will still be included in the contract documents and no further consultation is necessary. The NH Natural Heritage Bureau reviewed the project area and identified records of spotted turtle and wood turtle in the vicinity of the work. Coordination with NH Fish and Game (NHFG) has been completed and the design has been altered to address concerns associated with protected turtle species, specifically actions to address the perched condition at Location 1.

SECTION I.V - PUBLIC COMMERCE, NAVIGATION, OR RECREATION (Env-Wt 313.03(b)(5))

Describe how the project avoids and minimizes impacts that eliminate, depreciate or obstruct public commerce, navigation, or recreation.

The proposed design/work at both locations will allow traffic to continue to flow along interstates I-89 and I-93 as well as local roads during construction. The intermittent stream (Location 1) is not used for water recreation nor is it an identified fishing location. The ponded wetland (Location 2 inlet) is within the I-89/I-93 ROW and is not accessible by the public. Temporary Impacts to the Turkey River will be from the banks within the I-89 ROW, which are not accessible by the public. Temporary cofferdams will not obstruct flow or significantly alter flow patterns in the Turkey River.

Work at the culvert inlets will require that the adjacent recreational trail be closed during work hours. Written notice will be provided to the Town and advance notice of the times and dates of closures will be posted at the ends of the trail segment using portable message boards. Due to the close proximity of the culvert inlets to the trail, there is no practicable way to maintain unobstructed trail access at all times. Constructing temporary or permanent ADA compliant trail widenings or bypass sections of trail would require temporary restrictions to trail access similar in time and duration to what is proposed for the culvert project.

Work at each inlet location is expected to take about 15 work days. The trail can remain open during non-work hours and non-work days (typically no work on weekends and holidays).

SECTION I.VI - FLOODPLAIN WETLANDS (Env-Wt 313.03(b)(6))

Describe how the project avoids and minimizes impacts to floodplain wetlands that provide flood storage.

The proposed rehabilitation at both locations will not have any effect on floodplain wetlands. As defined by Env-Wt 103.10 and Env-Wt 102.01 floodplain wetlands are wetlands located within a 100-year floodplain, as identified by FEMA's FIRM maps. The Turkey River is in the FEMA zone AE and there are two delineated wetlands (PEM1E and PFO1Ex) within the floodplain within the project area. Impacts to these two wetlands were avoided; no impacts to these wetlands are proposed.

SECTION I.VII - RIVERINE FORESTED WETLAND SYSTEMS AND SCRUB-SHRUB – MARSH COMPLEXES (Env-Wt 313.03(b)(7))

Describe how the project avoids and minimizes impacts to natural riverine forested wetland systems and scrub-shrub – marsh complexes of high ecological integrity.

Avoidance of all impacts is not practicable due to the poor structural condition of the existing culverts. The proposed design has the least impact to wetlands of any practicable alternative. Impacts at the culvert inlet and outlet are temporary. Disturbed jurisdictional areas will be restored to existing conditions.

The impacts to the riverine wetlands in the project area are temporary and will be restored back to existing conditions at the completion of the project. There were no scrub-shrub marsh complexes of high ecological integrity found within the project area.

SECTION I.VIII - DRINKING WATER SUPPLY AND GROUNDWATER AQUIFER LEVELS (Env-Wt 313.03(b)(8))

Describe how the project avoids and minimizes impacts to wetlands that would be detrimental to adjacent drinking water supply and groundwater aquifer levels.

The project will have no effect on wetlands that would be detrimental to adjacent drinking water supply and groundwater aquifer levels.

SECTION I.IX - STREAM CHANNELS (Env-Wt 313.03(b)(9))

Describe how the project avoids and minimizes adverse impacts to stream channels and the ability of such channels to handle runoff of waters.

At location 1, the 48" culvert carries an intermittent stream that outlets on the bank of the Turkey River, a perennial stream. Location 2 carries flow from a wetland to the bank of the Turkey River. The project includes only temporary impacts to the upstream and downstream channels. The proposed liners at locations 1 and 2 will not have a significant impact on outlet velocities or surface water elevations. The intermittent stream and ponded wetland will continue to capture, contain, and convey stormwater runoff in the same manner as they do today. The surrounding landscape topography will not be changed as a result of this project, therefore stormwater runoff will enter the stream systems the same way it currently does.

SECTION I.X - SHORELINE STRUCTURES - CONSTRUCTION SURFACE AREA (Env-Wt 313.03(c)(1))

Describe how the project has been designed to use the minimum construction surface area over surface waters necessary to meet the stated purpose of the structures.

N/A - The project does not involve shoreline structures.

SECTION I.XI - SHORELINE STRUCTURES - LEAST INTRUSIVE UPON PUBLIC TRUST (Env-Wt 313.03(c)(2))

Describe how the type of construction proposed is the least intrusive upon the public trust that will ensure safe docking on the frontage.

N/A

SECTION I.XII - SHORELINE STRUCTURES – ABUTTING PROPERTIES (Env-Wt 313.03(c)(3))

Describe how the structures have been designed to avoid and minimize impacts on ability of abutting owners to use and enjoy their properties.

N/A

SECTION I.XIII - SHORELINE STRUCTURES – COMMERCE AND RECREATION (Env-Wt 313.03(c)(4))

Describe how the structures have been designed to avoid and minimize impacts to the public's right to navigation, passage, and use of the resource for commerce and recreation.

N/A

SECTION I.XIV - SHORELINE STRUCTURES – WATER QUALITY, AQUATIC VEGETATION, WILDLIFE AND FINFISH HABITAT (Env-Wt 313.03(c)(5))

Describe how the structures have been designed, located, and configured to avoid impacts to water quality, aquatic vegetation, and wildlife and finfish habitat.

N/A

SECTION I.XV - SHORELINE STRUCTURES – VEGETATION REMOVAL, ACCESS POINTS, AND SHORELINE STABILITY (Env-Wt 313.03(c)(6))

Describe how the structures have been designed to avoid and minimize the removal of vegetation, the number of access points through wetlands or over the bank, and activities that may have an adverse effect on shoreline stability.

N/A

PART II: FUNCTIONAL ASSESSMENT	
REQUIREMENTS	Ensure that project meets the requirements of Env-Wt 311.10 regarding functional assessment (Env-Wt 311.04(j); Env-Wt 311.10),
FUNCTIONAL ASSESSMENT METHOD USED:	US Army Corps of Engineers Highway Methodology
NAME OF CERTIFIED WETLAND SCIENTIST (FOR NON-TIDAL PROJECTS) OR QUALIFIED COASTAL PROFESSIONAL (FOR TIDAL PROJECTS) WHO COMPLETED THE ASSESSMENT:	JUSTIN SHERMAN AND DIANE DEVRIFE UNDER SUPERVISION OF CYNTHIA BALCIUS OF STONEY RIDGE ENVIRONMENTAL LLC
DELINEATION PER ENV-WT406	
DATE OF ASSESSMENT:	12/4/2020 AND 2/4/2020
Check this box to confirm that the application includes a NARRATIVE ON FUNCTIONAL ASSESSMENT:	<input checked="" type="checkbox"/>
For minor or major projects requiring a standard permit without mitigation, the applicant shall submit a wetland evaluation report that includes completed checklists and information demonstrating the RELATIVE FUNCTIONS AND VALUES OF EACH WETLAND EVALUATED. Check this box to confirm that the application includes this information, if applicable:	<input checked="" type="checkbox"/>
Note: The Wetlands Functional Assessment worksheet can be used to compile the information needed to meet functional assessment requirements.	



**PUBLIC HIGHWAYS
PROJECT-SPECIFIC WORKSHEET
FOR STANDARD APPLICATION**



**Water Division/Land Resources Management
Wetlands Bureau**

Check the Status of your Application

RSA/Rule: RSA 482-A/ Env-Wt 522

APPLICANT LAST NAME, FIRST NAME, M.I.: NH Dept. of Transportation

This worksheet summarizes the criteria and requirements for a Standard Permit for “Public Highways”, one of the 18 specific project types in Chapter Env-Wt 500. In addition to the project-specific criteria and requirements on this worksheet, all Standard Dredge and Fill Applications must meet the criteria and requirements listed in the Standard Dredge and Fill Application form (NHDES-W-06-012).

SECTION 1 - APPLICABILITY AND EXEMPTION (Env-Wt 527.01; Env-Wt 527.06(b))

This worksheet is for construction and maintenance projects for public highways in jurisdictional areas, but not for:

- Activities relating to stream crossings (which must be undertaken in accordance with Env-Wt 900);
- Public highway projects that impact tidal resources (which must be undertaken in accordance with Env-Wt 600); or
- Bank stabilization projects (which must be undertaken in accordance with Env-Wt 514).

Replacement of dislodged rocks on an existing rip-rap portion of a legally existing permitted road embankment to stabilize the structure may be done without a permit.

SECTION 2 - APPROVAL CRITERIA FOR PUBLIC HIGHWAY PROJECTS (Env-Wt 527.02)

An application for public highway project must meet the following approval criteria, subject to the rebuttable presumption in RSA 482-A:3, I-a that for applications proposed, sponsored, or administered by the New Hampshire Department of Transportation (NHDOT), NHDOT has exercised appropriate engineering judgment in the project’s design:

- The project meets the design criteria specified in Env-Wt 527.04;
- The project is consistent with RSA 482-A:1, RSA 483, RSA 483-B, RSA 485-A, and RSA 212-A;
- The purpose of the project is to improve or maintain public safety, consistent with federal and state safety standards;
- The project will not cause displacement of flood storage wetlands or cause diversion of stream flow impacting abutting landowner property; and
- For a project in the 100-year floodplain, the project will not increase flood stages off-site.

irm@des.nh.gov or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO BOX 95, Concord, NH 03302-0095

www.des.nh.gov

SECTION 3 - APPLICATION REQUIREMENTS FOR PUBLIC HIGHWAY PROJECTS (Env-Wt 527.03)

Please provide the following information:

- A description of the scope of the project, the size of the impacts to aquatic resources, and the purpose of the project;
- The purpose of the project is to rehabilitate two corrugated metal pipes (cmp) installed under I-89 constructed in 1958. Location 1 is a 292' long 48" cmp carrying an unnamed tier 1 stream underneath I-89 at 840' west of I-93. Location 2 is a 223" long 18" cmp carrying local runoff underneath I-89 at 225' west of I-93. Both locations are severely rusted with voids at their inverts, with location 1 having holes in the upper sides of the pipe and a perched outlet. The proposed design is a cured in-place liner for the 48" cmp and slip lining the 18" cmp with a 12" pipe liner. Incidental work will include the repair of the 48" inlet headwall and resetting riprap / replacing missing stones at the 48" pipe outlet to eliminate the perch.
- Total Temporary impacts 4,659 SF / 291 LF
- An accurate drawing with existing and proposed structure dimensions clearly annotated to:
- Document existing site conditions;
 - Detail the precise location of the project and show the impact of the proposed activity on jurisdictional areas;
 - Show existing and proposed contours at 2-foot intervals;
 - Show existing and proposed structure invert elevations on the plans; and
 - Use a scale based on standard measures of whole units, such as an engineering rule of one to 10, provided that if plans are not printed at full scale, a secondary scale shall be noted on the plans that identifies the half scale unit of measurement;
- All easements and right-of-way acquisition area outlines in relation to the project;
- The name of the professional engineer who developed the plans, whether an employee of the applicant or at a consulting firm; and
- An erosion control plan that shows:
- Existing and proposed contours at 2-foot intervals, with existing contours shown with a lighter line weight and proposed contours shown with a heavier line weight such as a bold font; and
 - The outermost limit of all work areas, including temporary phasing work, with perimeter controls.

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SECTION 4 - DESIGN REQUIREMENTS FOR PUBLIC HIGHWAY PROJECTS (Env-Wt 527.04)

In addition to meeting all applicable criteria established in Env-Wt 300, all projects must:

- Protect significant function wetlands, watercourses, and priority resource area(s);
- Minimize impacts to wetland and riparian function;
- Maintain wetland and stream hydrology and function to the remaining aquatic resources;
- Use on-site measures to compensate for any loss of flood storage where the project proposes:
 - Filling or placement of structures in a 100-year floodplain; or
 - Greater than 0.5 acre-feet of fill volume or a road crossing that affects floodplain conveyance;
- Use on-site minimization and water quality protection measures to prevent direct discharge to surface waters and wetlands, including retention of vegetated filter strips between the construction area and the aquatic resource areas to disperse runoff with no direct discharge to natural wetlands or surface waters; and
- Where temporary impacts will occur, include re-establishment of a similar ecosystem using vegetative species and spacing that are as similar as practicable to what was removed unless the applicant shows that the proposed vegetative composition will provide higher functions and values.

SECTION 5 - CONSTRUCTION REQUIREMENTS FOR PUBLIC HIGHWAY PROJECTS (Env-Wt 527.05)

In addition to complying with all applicable conditions in Env-Wt 307, the following construction requirements apply to public highway projects:

- The permit shall be contingent on review and approval by NHDES of final stream diversion and erosion control plans that detail the timing and method of stream flow diversion during construction and show temporary siltation, erosion, and turbidity control measures to be implemented; and
- The contractor responsible for completion of the work shall use techniques described in Env-Wq 1504.06, Env-Wq 1504.16, Env-Wq 1505.02, Env-Wq 1506, and Env-Wq 1508.

SECTION 6 - PUBLIC HIGHWAY PROJECTS PROJECT CLASSIFICATION (Env-Wt 527.07)

Public highway projects shall be classified based on the dimensions established in Env-Wt 407, subject to the adjustments and project exceptions established in Env-Wt 407.

CULVERT REHABILITATION PROJECT
48” and 18” culverts under I-89
BOW, NH
NHDOT PROJECT NO. 42704
SUPPLEMENTAL NARRATIVE

Project Description

This project has two pipe rehabilitation locations. Location 1 is a 48” corrugated metal culvert (cmp) that carries an unnamed stream under I-89 at 840’ west of I-93. Location 2 is an 18” corrugated metal culvert (cmp) that carries local runoff under I-89 at 225’ west of I-93.

This project was initiated under NHDOT’s Federal Culvert Replacement/Rehabilitation & Drainage Repair (CRDR) Program. The Program purpose is to address major culvert and drainage needs statewide that are not being addressed through current or future Capital Improvement or other programmatic projects. The Program receives \$2,000,000 in total funding annually, which includes construction, engineering, and ROW costs. Projects are selected and scheduled based primarily on the condition of the culvert (risk of failure), Road Tier, traffic volume, depth of fill, and detour length (potential impact of failure). The Program funding is fully committed for at least the next three years.

The 48” culvert is one of the highest statewide priority locations out of nearly 50 known locations eligible for the Program. I-89 is a Tier 1 roadway, with 2019 traffic volume over 54,000 vehicles per day.

The 18” culvert is not ranked under the CRDR Program, but is included in this project based on road tier, condition, depth of fill, and proximity to the 48” culvert.

Failure to address the structural deficiency of these culverts risks deformation of the culverts which would make rehabilitation impossible and/or collapse of the culverts which could cause serious impacts to downstream wetlands, public/private infrastructure, and the travelling public. The project intent is to address the structural deficiencies as soon as practical, while maintaining hydraulic capacity, and avoiding or minimizing impacts to resources in the area.

The proposed advertising date is September 14, 2021, with construction anticipated to begin in summer of 2022. Project duration is expected to be 8 – 10 weeks.

Existing Conditions

The project area is located at the southern end of I-89 and bordered by the I-89 off ramp to I-93 and the I-93 off ramp to I-89, South St to the west, and I-93 to the east. This area is highly developed with roadway infrastructure, and commercial and residential development. In this area, NH Route 3A and the Merrimack River are about 1,000’ northeast of I-93. The 48” and 18” culverts both flow to the northwest under I-89 and outlet through the armored bank of the Turkey River. At the 48” outlet, the area between I-89 and the Turkey River is mostly wooded with guardrail and a very steep embankment above the river’s top of bank. At the 18” outlet, the area between I-89 and the Turkey River is mostly grass with thin strip of woods on the riverbank. The upper watershed is mostly

undeveloped woods. The lower watershed has some state and local roads, residential development and one school. A shared use path (also known as a multi-use path and/or recreational trail) runs generally parallel to I-89, within the existing ROW, and very close to both culvert inlets. The trail is paved, approximately 8' wide, with fencing on both sides for the majority of its length. The trail segment begins at the end of Valley Road and extends to NH Route 3A. Access to the culvert inlets will be from the trail, and access to the outlets will be from the edge of I-89.

Existing detail shown on the Plans is from NHDOT survey from previous projects 13742 and 13742B (NGVD29 Datum) and supplemented by information from archive plans and field reviews.

LIDAR contours were developed from UNH GRANIT data (Merrimack Watershed, 2011-2012, NAVD88 datum). LIDAR contours were only used where survey and archive plan information was not available, primarily for delineation of watersheds outside the immediate project area. LIDAR contours are shown on the Plans to provide a consistent representation of the topography for the entire project area, rather than showing separate contour sets from different surveys which have some overlaps and gaps in coverage.

In this area the NAVD88 datum is 0.62' lower than the NGVD29 datum. Elevations noted in the Plans and application are referenced to the NGVD29 datum unless otherwise noted.

Location 1

The 48" cmp carries an intermittent stream underneath I-89 and discharges directly to the Turkey River. At the inlet, the 48" cmp has an L shaped mortared stone headwall. The inlet area of the 48" cmp is mostly wooded with small wetlands adjacent to the channel on both sides. The inlet is separated from the trail by a chain link fence. An 18" concrete pipe carrying closed drainage discharges adjacent to the 48" inlet.

Farther upstream of the 48" cmp, the stream has significant alterations to a distance of about 600'. The stream passes through two 48" rcp road culverts and underneath a historic barn approximately 300' upstream before reaching the 48" cmp. The majority of the banks in the upstream altered segment are confined by stone retaining walls.

Upstream road culverts and stream channels were found to have similar capacities as the 48" cmp and analysis found that no bypass or overtopping of banks for flows up to Q100. All of the flow from the 48" cmp watershed is assumed to reach the 48" inlet.

At the outlet, the 48" cmp has a mitered end with a substantial perch when the Turkey River water level is low as documented in a 2016 field review for previous Project 40766. The perch was about 6" at the time of the consultant stream assessment.

The 48" culvert was constructed in 1958 as part of the project that constructed the I-89 connection to I-93 and the relocation of the Turkey River. The 48" cmp is approximately 292' long with a slope of 1.2%. NHDOT Maintenance District 5 reports no history of flooding or damage associated with this culvert. There are voids along the pipe invert and lower sides and holes in upper sides. There is a stone and mortar headwall at the inlet in need of minor repairs and a mitered outlet that is set directly into the bank of the Turkey River. Maximum cover is 25'.

The crossing was determined to be a Tier 1 crossing based on a drainage area of 144.4 ac/0.23 sq mi. as determined from LIDAR contours. The boundary and flow lines from USGS Streamstats produced did not agree with survey or LIDAR. Additional contributing drainage area was found along Logging Hill Road due to closed drainage, and in the northeast corner of the watershed due to a berm along the recreational trail. The NHDES Permit Planning Tool returned a drainage area of 0.176 Sq mi. The Streamstats Q100 (for 0.18 Sq mi) was 44.9 cfs. Pro-rating the flow for the 0.23 Sq mi drainage area yields a Q100 of 57.4 cfs.

The SCS method (Hydrocadd) predicts Q100 = 112 cfs for 7.03" of rain in 24 hours (NOAA rainfall data, Atlas 14, 2019) and the FHWA Regression method predictions of Q100 from varied from 73 to 105 cfs. Design flows were set at the upper limits of FHWA Regression method predictions as follows:

$$Q2 = 27 \text{ cfs}, Q10 = 57 \text{ cfs}, Q50 = 91 \text{ cfs}, Q100 = 105 \text{ cfs}$$

FHWA's HY-8 culvert software (v 7.50) was used for capacity and velocity analysis. Should bypass occur, the flow path would be along the rec trail and through several cb's and pipes to the inlet area of the 18" cmp. Bypass would occur for headwater elevations at or above EL 236.5.

Due to the difficulty of accurately modelling the tailwater effect of the Turkey River on the 48" cmp, the two extreme cases were modelled to provide conservative results for capacity and velocity. For capacity / headwater modelling, the HY-8 model was run with the Turkey River at maximum flow (El 229.4) and for velocity the model was run with the Tukey River at an estimated average low flow level (river elevation 224.0). The FEMA map does not show a Q100 elevation near the 48" cmp outlet, so the Q100 elevation was estimated based on USGS Streamstats Q100 flow rate of 1,450 cfs and average channel cross section from survey. Model results are as follows:

River High case: Q100 flow through 48" cmp = 105 cfs	Headwater El = 236.30
Q 50 flow through 48" cmp = 91 cfs	Headwater El = 234.18

River Low case: Q100 flow through 48"cmp = 105 cfs	Outlet velocity = 10.04 ft/s
Q 50 flow through 48"cmp = 91 cfs	Outlet velocity = 9.35 ft/s

The predicted Q100 headwater is below the bypass elevation (236.5), and the maximum anticipated outlet velocity is acceptable for the heavily armored Turkey River channel.

Location 2

The 18" cmp is approximately 223' long with a slope of 0.85%. This culvert was also built as part of the same 1958 project that constructed the 48" cmp. The 18" cmp carries local runoff under I-89 at 225' west of I-93 from a ponded wetland bounded by roadway embankments (I-89, I-93, and the ramp from I-89 SB to I-93 NB).

The 18" cmp inlet is set into the recreation trail embankment and is partially blocked with sediment, stones, and debris. The outlet is set into the bank of the Turkey River.

Available storage at the 18” inlet is approximately 6.4 ac-ft at elevation 232.62 (lowest adjacent trail elevation). If bypass were to occur, the path would be northeast along the rec trail, under the I-93 bridges, into the low area surrounded by the I-89 SB to I-93 NB ramp, and then through a culvert into the Turkey River. The elevation at which bypass would occur is 234.36, at a high point in the trail under the I-93 bridges.

NHDOT contracted with a consultant to perform a video inspection of the 18” cmp, which was completed on 4/19/21. The pipe was found to be still round and suitable for sliplining. There were some rocks inside, and there is a slight bend about 16’ in from the inlet. The bend is not sharp enough to prevent lining, but it may reduce the maximum diameter of the liner that will fit.

Due to the difficulty of accurately modelling the tailwater effect of the Turkey River on the 18” cmp, the two extreme cases were modelled to provide conservative results for capacity and velocity. For capacity / headwater modelling, the Hydrocadd model was run with the Turkey River at maximum flow (FEMA Q100 elevation adjusted to survey datum, El 226.62) and for velocity the model was run with the Turkey River at low flow (river elevation equal to the 18” cmp outlet invert) The Q100 inflow to the wetland at the inlet was 26.7 cfs for all cases. Model results are as follows:

River High case: Q100 flow through 18” cmp = 3.07 cfs	Headwater El = 227.36
River Low case: Q100 flow through 18”cmp = 7.52 cfs	Outlet velocity = 4.18 ft/s

The predicted Q100 headwater is about 5’ lower than the lowest trail elevation (232.62), and the maximum anticipated outlet velocity is acceptable for the heavily armored Turkey River channel.

Resources

Environmental review and coordination for this project was performed by Hoyle, Tanner Associates Inc. (HTA) under contract with NHDOT. Site photos, delineations, and stream and wetlands assessments were performed by sub-consultant Stoney Ridge Environmental, LLC (SRE). See the report titled Wetland Delineation, Stream Assessment, and Invasive Plant Species Report included elsewhere in this application.

Note that the referenced report uses a different naming convention for identifying wetlands (A, B, C, etc.) vs the NHDOT convention which numbers the wetlands (1, 2, 3, etc.) and labels impact areas as A, B, C, etc.

The project was presented at the February 17, 2021 Natural Resource Agency meeting, where representatives from DES, NH Fish & Game, DNCR- NHB, Army Corp of Engineers, EPA, and TNC were all in attendance. For comments and discussions with these agencies please review the minutes from the meeting provided elsewhere within the application and other records of communication and coordination. NHDOT is seeking and is anticipating to be covered by the Army Corps State General Permit.

Town Officials, including the Bow Conservation Commission, were contacted in December, 2020. The Conservation Commission did respond to the request for information about the project area, however, they did not express concerns for the proposed work or list recommendations for incorporation into the design. An initial letter was also sent to the Upper Merrimack River Local Advisory Committee, however, no response has been received to date.

Other resources / concerns in the project area include:

Threatened and Endangered Species:

- The project is in the range of Northern long-eared bat (NLEB). Tree clearing of suitable habitat trees is proposed during the NLEB active season. The US Fish and Wildlife Service (USFWS) Information for Planning and Conservation (IPAC) webtool was used to determine that the project qualifies for the January 5, 2016 FHWA Programmatic Biological Opinion on Final 4(d) Rule for the NLEB and Activities Excepted from Take Prohibitions. The USFWS has concurred that the project may affect the NLEB, however, any take that may occur as a result of the proposed project is not prohibited under the ESA Section 4(d) Rule adopted for this species. All appropriate Avoidance and Minimization Measures will still be included in the contract documents and no further consultation is necessary.
- Small Whorled Pogonia (SWP): This species was not identified in the most recent Official Species List generated by the USFWS IPAC tool, however, a survey was conducted in June 2020 and no populations of SWP were identified at the project site at that time.
- NHB reviewed the project area and identified known records for wood turtle and spotted turtle in the vicinity of the proposed work. Coordination with NHFG has been completed and alterations to the design have been incorporated to improve passage through the 48" CMP by addressing the perch at the outlet in the bank of the Turkey River. The mitered end of the 48"cmp will be trimmed to match the bank of the Turkey River and existing riprap will be reset under and around the pipe outlet to eliminate the perch. Stones will be mortared in place to match the original 1958 design. Additionally, the Contractor will be required to use wildlife friendly erosion control netting and all construction personnel will have access to informational flyers with identification tips and conservation measures provided by NHFG.

Cultural Resources:

- A file review of the project location was performed on November 9, 2020 using the NHDHR EMMIT system. Two properties (Upton House & Store and Lamora's Garage) were identified in proximity of the Area of Potential Effect that are National Register Eligible. Four other properties were identified and have determinations of Not Eligible for the National Register. The project was submitted for review to NHDHR and no impacts to these two eligible properties listed above are anticipated. The Section 106 Programmatic Agreement Appendix B was used to determine that the project will have No Potential to Cause Effects to historic resources.

Shared Use Path / Recreational Trail:

- Per coordination with FHWA, it has been determined that this facility qualifies for an exception to the requirement for Section 4(f) approval per 23 CFR 774.13(f)(3) which states that "trails, paths, bikeways, and sidewalks that occupy a transportation facility right-of-way without limitation to any specific location within that right-of-way, so long as the continuity of the trail, path, bikeway, or sidewalk is maintained."

Water Quality:

- No increase in impervious area, no permanent stormwater treatment provided.
- The project will result in less than 1 acre of contiguous earth disturbance, therefore CGP coverage is not required.
- AOT: The level of disturbance meets the Alteration of Terrain threshold of greater than 2,500 SF disturbance within 50' of a surface water. The project has been reviewed by the Department's Water Quality Program and has been determined not to have a negative effect on water quality in the project area as all necessary erosion control BMPs will be installed and maintained during construction. The project meets the intent of the Department's MOU with the Alteration of Terrain Bureau.

Floodplains:

- The Turkey River has a FEMA delineated floodplain (Zone AE), but mapping does not extend upstream of the 48" cmp or 18" cmp outlets. The 100-year floodplain shown on the Plans was traced from FIRM maps (Map #'s 3301C0541E and 3301C0542E)
- There are two delineated wetlands within the Turkey River floodplain. No impact to these wetlands is proposed.

Invasive Species:

Numerous Type I and some Type II invasive plants were delineated within the project area. Minor impacts to Type I plants are anticipated at the 48" pipe inlet. No impacts anticipated at the 48" outlet. Impacts to Type II plants are anticipated at the 18" inlet. No impacts anticipated at the 18" outlet.

The Contractor will be required to perform all work activities in accordance with the Department publication "Best Management Practices for the Control of Invasive and Noxious Plant Species" in order to prevent the spread of invasive species to the site during construction.

Impaired waters:

According to the 2018 Draft 303(d) list the Unnamed Brook conveyed by the 48" cmp (Location 1) is severely impaired for aquatic life due to alkalinity due to carbonate as CaCO₃, aluminum, chloride, phosphorus and pH and is marginally impaired for fish consumption due to mercury. The proposed action would not add to these impairments."

Other:

There are no prime wetlands located within the project area. The Turkey River is a Shoreland Water Quality Protection Act protected waterbody. Any impacts to the 250' protected buffer not included in this application will be permitted appropriately.

Alternatives for the 48" cmp

Two replacement alternatives were considered:

To replace the 48" corrugated metal pipe with a crossing designed to the UNH stream crossing guidelines and Rosgen classification, it would require a 10' span precast box culvert on new alignment by open cut, with Construction Cost estimated at \$3.95 million

A hydraulically sized replacement culvert would be a culvert sized to pass Q50 without submerging the inlet. A 54" concrete pipe on new alignment constructed by bore and jack would be required, with Construction Cost estimated at about \$1.4 million. The construction cost for rehabilitation of both pipes by the methods proposed is currently \$454,138.

Both options would have significantly larger impacts and total project costs well over the construction estimates listed.

- A compliant replacement structure could be an open or closed bottom structure, or a pipe culvert, with or without stream simulation (Env-Wt 904.03). A 10' span precast box culvert was used to evaluate cost and impacts.
- The structure would need to be approximately 300' long on new alignment, parallel to and far enough away so that construction would not impact the existing 48" cmp which would be used to maintain the existing stream flow.
- Impacts and costs for this option were based on a precast box culvert constructed by open cut with phased construction.
- Using NHDOT's Bridge Estimate template with 100' rail to rail road width, 29' height from streambed to finish grade, \$200,000 for Cofferdams, \$30,000 to fill and abandon existing 48" cmp. 100' of approach roadway reconstruction on each side. Reimbursable impacts to a Town owned sewer line are likely, but not included.
- Two lanes of traffic in each direction would need to be maintained on portions of existing roadways and/or on temporarily widened areas supported by cofferdams. Several major changes in traffic patterns and associated cofferdams would be required.
- The cost for this option is estimated at \$3.95 million, not including design, ROW acquisition, permitting, reimbursable utility impacts, and reconstruction of portions of the SB off ramp to I-93 and the rec trail.
- A hydraulically sized replacement culvert was also considered - 54" concrete pipe. Due to the amount of highway and utility infrastructure and traffic volumes, this culvert would likely be constructed by tunneling or bore & jack, similar to the I-393 culvert replacements completed a few years ago. It would also be on new alignment, at least 20' away from the existing 48" cmp.
- Access and staging areas for this type of construction are very large, for one location on I-393 the inlet access and work area was about 400' x 150' and the outlet work area was about 80' x 100'. Cost for the replacement 54" x 185' long concrete pipe under I-393 (project 16288) was \$775,754 in 2017. Cost for a similar installation, pro-rated to 292' long and adjusted for inflation is estimated at \$1,385,000, excluding incidental construction items noted above.
- **The replacement alternatives are not considered feasible within the Culvert Program budget and schedule.**
- If replacement was selected, design and construction would likely be shifted to the Bow-Concord I-93 improvement project which is currently in the alternative selection phase. The current preferred alternative for the Bow-Concord project proposes significant changes to I-89 and ramps but does not impact the majority of the culvert barrels, the outlets, or the Turkey River. The inlet areas of the 48" and 18" cmp's would require some modification. Start of construction is estimated to be at least 10 years away.

- Rehabilitation using spray on mortar liners was not selected due to the anticipated thickness required for a fully structural rehabilitation and resulting reduction in capacity.
- Concrete invert repair is not considered feasible due to the relatively small diameter and length of the existing culvert, and holes in the sides above half the diameter.
- In the event that the 48" cmp begins to lose shape or develop sinkholes, the Department would likely apply for an emergency permit to slipline with the largest pipe liner that would fit. This rehabilitation method is not proposed for this project due to reduction in capacity.

Proposed rehabilitation for the 48" cmp

The 48" cmp will be slip lined with a cured in place liner. This type of liner is less than 1" thick and will conform to the existing corrugations, raising the culvert invert by less than one inch. Overall barrel roughness will be reduced with resulting small increases in capacity and velocity.

The same analysis method was used to evaluate the rehabilitated 48" cmp. The two extreme cases were modelled to provide conservative results for capacity and velocity. For capacity / headwater modelling, the HY-8 model was run with the Turkey River at maximum flow (river elevation 229.4) and for velocity the model was run with the Turkey River at low flow (river elevation 224.0). Model results are as follows:

River High case: Q100 flow through liner = 105 cfs Headwater El = 234.85 (vs 236.30 existing)
Q 50 flow through liner = 91 cfs Headwater El = 234.12 (vs 234.18 existing)

River Low case: Q100 flow through liner = 105 cfs Outlet velocity = 11.19 ft/s (vs 10.04 existing)
Q 50 flow through liner = 91 cfs Outlet velocity = 10.92 ft/s (vs 9.35 existing)

The predicted Q100 headwater is 1.45' lower than existing and below the bypass elevation (236.5), and the maximum anticipated outlet velocity is acceptable for the heavily armored Turkey River channel. At low flows, velocities are significantly less. For example, at 6" flow depth (4 cfs) velocity increases from 3.6 ft/s for existing to 4.6 ft/s for the 12" liner.

The mitered end of the 48" cmp will be trimmed to match the bank of the Turkey River and existing riprap will be reset under and around the pipe outlet. Stones will be mortared in place to match the original 1958 design. See Exhibit 1 – Archive Plan attached to this Supplemental Narrative. The stone and mortar inlet headwall of the 48" cmp will also be repaired and repointed. This design decision was developed in conjunction and consultation with NH Fish and Game. (See coordination summarized later in the application).

Alternatives for the 18" cmp

Rehabilitation alternatives for the 18" cmp are limited due to the small diameter. Methods that require access inside the culvert such as shotcrete invert repair are not practical. Cured in place lining requires invert repair and grouting of voids prior to insertion of the liner. There are no practicable alternatives, other than sliplining, with less impacts and costs.

Replacement alternatives were not studied in detail due to the anticipated costs and impacts, and the uncertainty associated with the future Bow-Concord I-93 / I-89 improvements as referenced above in the alternatives discussion for the 48" cmp.

In the event that the 18" cmp begins to lose shape or develop sinkholes, the Department would likely apply for an emergency permit to fill and abandon the existing pipe and install a new pipe by directional drilling. Access and staging areas for this type of construction would be significantly larger than for the rehabilitation option.

Proposed rehabilitation for the 18" cmp

The proposed rehabilitation for the 18" cmp is slip lining with a 12" diameter smooth interior pipe liner. Smooth interior pipe is required to minimize wall thickness and maximize diameter and capacity. Materials considered were steel and solid wall polyethylene. Heavy gage steel would only be selected if there were minor obstructions in the 18" cmp that could not be removed by cleaning. Both materials would have similar internal roughness and hydraulic performance. The liner length will match the existing 18" cmp length and the liner invert will be set as close as practical to the 18" cmp invert.

Based on the 4/19/21 video inspection, the solid wall polyethylene liner was selected. The maximum size that could be expected to fit in a straight and perfectly circular 18" pipe is a 16" (outside diameter) liner. To allow additional clearance for the slight bend and shape irregularities, a 12" inside diameter liner was selected. Wall thickness for liners in this size range is less than 1", so the liner invert will be no more than 1" above the existing 18" cmp invert. After insertion of the liner, the annular space will be filled with grout. This process will also fill any voids along the invert and minor voids outside the 18" cmp.

Analysis of the proposed liner follows the same method as for the existing 18" cmp. For capacity / headwater modelling, the Hydrocadd model was run with the Turkey River at maximum flow (FEMA Q100 elevation adjusted to survey datum, El 226.62) and for velocity the model was run with the Turkey River at low flow (river elevation equal to the 12" liner outlet invert) The Q100 inflow to the wetland at the inlet was 26.7 cfs for all cases. Model results are as follows:

River High case: Q100 flow through liner = 2.27 cfs	Headwater El = 227.64
River Low case: Q100 flow through liner = 5.16 cfs	Outlet velocity = 6.56 ft/s

The predicted increase in Q100 headwater is 0.28', still close to 5' lower than the lowest trail elevation (232.62). The maximum anticipated outlet velocity is still acceptable for the heavily armored Turkey River channel. At low flows, velocities are significantly less. For example, at Q2 (approximately 2 cfs culvert flow) velocities are nearly equal, ranging from 2.69 ft/s to 2.86 ft.s.

Site access to the 48" cmp

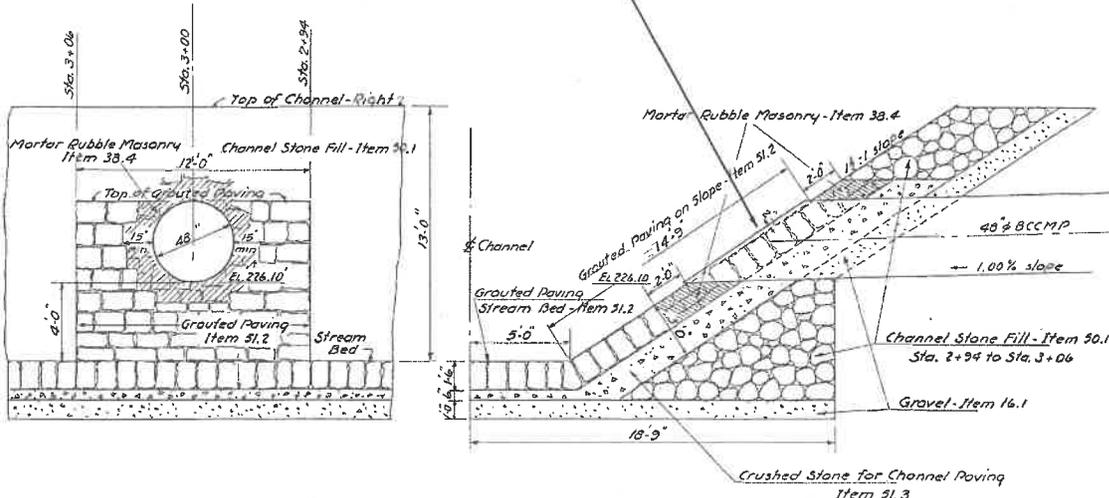
- Access to the 48" cmp inlet will be from Valley Road and the rec trail.
- Some tree clearing will be required but removal of stumps and root mat is not anticipated.
- Approximately 2,505 SF of clearing is anticipated at the inlet.
- Segments of the existing chain link fence at the inlet will be removed and reset when work is completed.
- 30' x 40' temporary construction easement is proposed at the inlet.

- The trail will need to be closed during most work operations at the inlet, but the trail can remain open during non-work hours and non-work days (typically no work on weekends and holidays). Work at the inlet is expected to take about 15 work days
- Access to the 48" cmp outlet will be from the edge of I-89 NB.
- Approximately 3,400 SF of clearing is anticipated at the outlet.
- Any riprap that is disturbed will be reset to match the existing bank.
- All work at the 48" cmp outlet is within the existing ROW.
- Stream flow can be pumped through the existing 48" cmp for most of the project duration. The pipe does need to be clean and dry during insertion and curing of the liner, which is expected to take only a few days. Insertion of the liner will be done during low flow and if feasible DOT encourages the contractor to schedule the work during a dry period when little to no streamflow is expected.
- Disturbed wetland areas will be restored using a wetland seed mix and where slopes are steeper than 4:1, a wildlife friendly erosion control matting will be used.

Site access to the 18" cmp

- Access to the 18" cmp inlet will be from I-89 SB and the rec trail,
- Some tree clearing will be required but removal of stumps and root mat is not anticipated.
- Approximately 1,420 SF of clearing is anticipated at the inlet.
- The trail will need to be closed during most work operations at the inlet, but the trail can remain open during non-work hours and non-work days (typically no work on weekends and holidays). Work at the inlet is expected to take about 15 work days.
- Access to the outlet will be from the edge of I-89 NB.
- Approximately 655 SF of clearing is anticipated at the outlet.
- Any riprap that is disturbed at the outlet will be reset to match the existing bank.
- Disturbed wetland areas will be restored using a wetland seed mix and where slopes are steeper than 4:1, a wildlife friendly erosion control matting will be used.
- All work for the 18" cmp is within the existing ROW.

PROJECT 42704 PROPOSES TO REPAIR THE 48" OUTLET TO ORIGINAL CONDITION BY TRIMMING THE MITERED OUTLET TO MATCH THE RIPRAP BANK AND REPLACING STONES UNDER AND AROUND 48" OUTLET, WITH STONES MORTARED IN PLACE.

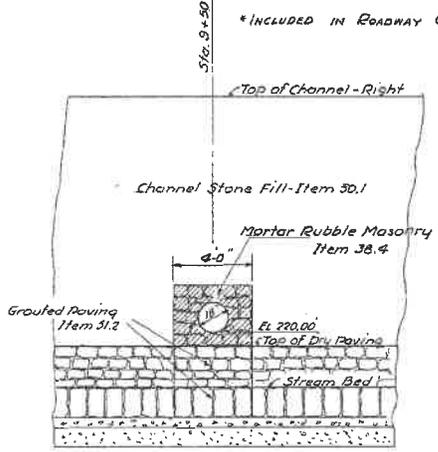


48" BCCMP ENTERING ON RIGHT AT STA. 3+00
(Pipe included in Roadway Quantities)

ESTIMATED QUANTITIES

* ITEM 6.1 EARTH TRENCH EXCAV. R.C.L.A. 13 C.Y.	* ITEM 38.4 MORTAR RUBBLE MASONRY 17 C.Y.	ITEM 50.1 CHANNEL STONE FILL 13 C.Y.	ITEM 51.2 GROUTED PAVING FOR STREAM BED 20 C.Y.
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* INCLUDED IN ROADWAY QUANTITIES



18" BCCMP ENTERING RIGHT STA. 9+50
(Pipe included in Roadway Quantities)

ESTIMATED QUANTITIES

* ITEM 38.4 MORTAR RUBBLE MASONRY 0.9 C.Y.	ITEM 51.2 GROUTED PAVING FOR STREAM BED BASE FOR CH PAVING 2.2 C.Y.	ITEM 51.3 CRUSHED STONE 2 TONS
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* INCLUDED IN ROADWAY QUANTITIES

Portion of Archive Plan - Project P3238A (1957), Sheet 58 showing original construction of the relocated Turkey River and 48" cmp and 18" cmp outlets.

Not to scale

STATE OF NEW HAMPSHIRE			
80W			
DEPARTMENT OF TRANSPORTATION		BUREAU OF HIGHWAY DESIGN	
Exhibit 1			
Archive Plan			
DCW	STATE PROJECT NO.	SHEET NO.	SHEET TOTAL
42704	Archive Plan exhibit 42704	1	1



AVOIDANCE AND MINIMIZATION CHECKLIST
 Water Division/Land Resources Management
 Wetlands Bureau
Check the Status of your Application



RSA/Rule: RSA 482-A/ Env-Wt 311.07(c)

This checklist can be used in lieu of the written narrative required by Env-Wt 311.07(a) to demonstrate compliance with requirements for Avoidance and Minimization (A/M), pursuant to RSA 482-A:1 and Env-Wt 311.07(c).

For the construction or modification of non-tidal shoreline structures over areas of surface waters without wetland vegetation, complete only Sections 1, 2, and 4 (or the applicable sections in Attachment A: Minor and Major Projects (NHDES-W-06-013)).

The following definitions and abbreviations apply to this worksheet:

- "A/M BMPs" stands for Wetlands Best Management Practice Techniques for Avoidance and Minimization dated 2019, published by the New England Interstate Water Pollution Control Commission (Env-Wt 102.18).
- "Practicable" means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes (Env-Wt 103.62).

SECTION 1 - CONTACT/LOCATION INFORMATION		
APPLICANT LAST NAME, FIRST NAME, M.I.: <u>NH Dept. of Transportation</u>		
PROJECT STREET ADDRESS: <u>I-89, 840' and 225' west of I-93</u>	PROJECT TOWN: <u>Bow</u>	
TAX MAP/LOT NUMBER: <u>N/A NHDOT ROW</u>		
SECTION 2 - PRIMARY PURPOSE OF THE PROJECT		
Env-Wt 311.07(b)(1)	Indicate whether the primary purpose of the project is to construct a water-access structure or requires access through wetlands to reach a buildable lot or the buildable portion thereof.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p>If you answered "no" to this question, describe the purpose of the "non-access" project type you have proposed:</p> <p>The purpose of this project is to rehabilitate ageing 48" and 18" corrugated metal culverts, valuable state assets, in order to support long term and safe use of the State's public transportation network.</p>		

SECTION 3 - A/M PROJECT DESIGN TECHNIQUES		
Check the appropriate boxes below in order to demonstrate that these items have been considered in the planning of the project. Use N/A (not applicable) for each technique that is not applicable to your project.		
Env-Wt 311.07(b)(2)	For any project that proposes new permanent impacts of more than one acre or that proposes new permanent impacts to a Priority Resource Area (PRA), or both, whether any other properties reasonably available to the applicant, whether already owned or controlled by the applicant or not, could be used to achieve the project's purpose without altering the functions and values of any jurisdictional area, in particular wetlands, streams, and PRAs.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 311.07(b)(3)	Whether alternative designs or techniques, such as different layouts, construction sequencing, or alternative technologies could be used to avoid impacts to jurisdictional areas or their functions and values.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 311.07(b)(4) Env-Wt 311.10(c)(1) Env-Wt 311.10(c)(2)	The results of the functional assessment required by Env-Wt 311.03(b)(10) were used to select the location and design for the proposed project that has the least impact to wetland functions.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 311.07(b)(4) Env-Wt 311.10(c)(3)	Where impacts to wetland functions are unavoidable, the proposed impacts are limited to the wetlands with the least valuable functions on the site while avoiding and minimizing impacts to the wetlands with the highest and most valuable functions.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 313.01(c)(1) Env-Wt 313.01(c)(2) Env-Wt 313.03(b)(1)	No practicable alternative would reduce adverse impact on the area and environments under the department's jurisdiction and the project will not cause random or unnecessary destruction of wetlands.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 313.01(c)(3)	The project would not cause or contribute to the significant degradation of waters of the state or the loss of any PRAs.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 313.03(b)(3) Env-Wt 904.07(c)(8)	The project maintains hydrologic connectivity between adjacent wetlands or stream systems.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 311.10 A/M BMPs	Buildings and/or access are positioned away from high function wetlands or surface waters to avoid impact.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 311.10 A/M BMPs	The project clusters structures to avoid wetland impacts.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 311.10 A/M BMPs	The placement of roads and utility corridors avoids wetlands and their associated streams.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
A/M BMPs	The width of access roads or driveways is reduced to avoid and minimize impacts. Pullouts are incorporated in the design as needed.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
A/M BMPs	The project proposes bridges or spans instead of roads/driveways/trails with culverts.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A

irm@des.nh.gov or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

www.des.nh.gov

A/M BMPs	The project is designed to minimize the number and size of crossings, and crossings cross wetlands and/or streams at the narrowest point.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 500 Env-Wt 600 Env-Wt 900	Wetland and stream crossings include features that accommodate aquatic organism and wildlife passage.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 900	Stream crossings are sized to address hydraulic capacity and geomorphic compatibility.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
A/M BMPs	Disturbed areas are used for crossings wherever practicable, including existing roadways, paths, or trails upgraded with new culverts or bridges.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
SECTION 4 - NON-TIDAL SHORELINE STRUCTURES		
Env-Wt 313.03(c)(1)	The non-tidal shoreline structure has been designed to use the minimum construction surface area over surfaces waters necessary to meet the stated purpose of the structure.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 313.03(c)(2)	The type of construction proposed for the non-tidal shoreline structure is the least intrusive upon the public trust that will ensure safe navigation and docking on the frontage.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 313.03(c)(3)	The non-tidal shoreline structure has been designed to avoid and minimize impacts on the ability of abutting owners to use and enjoy their properties.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 313.03(c)(4)	The non-tidal shoreline structure has been designed to avoid and minimize impacts to the public's right to navigation, passage, and use of the resource for commerce and recreation.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 313.03(c)(5)	The non-tidal shoreline structure has been designed, located, and configured to avoid impacts to water quality, aquatic vegetation, and wildlife and finfish habitat.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 313.03(c)(6)	The non-tidal shoreline structure has been designed to avoid and minimize the removal of vegetation, the number of access points through wetlands or over the bank, and activities that may have an adverse effect on shoreline stability.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A

**BUREAU OF ENVIRONMENT
CONFERENCE REPORT**

SUBJECT: NHDOT Monthly Natural Resource Agency Coordination Meeting

DATE OF CONFERENCE: February 17, 2021

LOCATION OF CONFERENCE: Virtual meeting held via Zoom

ATTENDED BY:

NHDOT

Sarah Large
Matt Urban
Andrew O'Sullivan
Ron Crickard
Mark Hemmerlein
Arin Mills
James McMahon
Rebecca Martin
Hans Weber
Dan Prehemo
Don Lyford
Tim Mallette
Meli Dube
Chris Carucci
Kirk Mudgett
Tobey Reynolds

ACOE

Christopher Marron

EPA

Jeanie Brochi

NHDES

Lori Sommer
Karl Benedict
Ann-Elizabeth Pelonzi
Phil Trowbridge

NHB

Amy Lamb

NH Fish & Game

Carol Henderson
John Magee

The Nature Conservancy

Pete Steckler

**Consultants/ Public
Participants**

Kimberly Peace
Deb Coon

PRESENTATIONS/ PROJECTS REVIEWED THIS MONTH: *(minutes on subsequent pages)*

Finalize Meeting Minutes.....	2
Milan, #43228	2
Newton, #29617 (X-A004(206)).....	4
Bow, #42704 (X-A004(950)).....	7

(When viewing these minutes online, click on a project to zoom to the minutes for that project.)

NOTES ON CONFERENCE:**Finalize Meeting Minutes**

Finalized and approved the January 20, 2021 meeting minutes.

Milan, #43228

Arin Mills, NHDOT Environmental Manager, presented the location of the project as a 5' x 7' arch corrugated metal pipe (CMP) replacement which carries NH 110-A over Cedar Brook in the town of Milan. Cedar Brook flows approximately 0.2 mile south into Cedar Pond, and flows from the outlet of Cedar Pond approx. 1.2 miles to the [North Branch Upper] Ammonoosuc River. Cedar Brook is a 1st order stream at the crossing, and therefore no Shoreland Water Quality Protection Act jurisdiction, and is a Tier 3 crossing. Plans were shown of the 1986 original culvert construction, to include the area at the inlet that was presumed to be used as traffic by-pass due to the evidence of disturbance. A tax map was shown, and it was noted the surrounding landscape is rural residential with no conservation lands identified adjacent to the project. The project will require construction and drainage easements which will be obtained prior to the start of work. Photos were shown of the existing roadway, to include the inlet and outlet of the crossing and the surrounding adjacent landscape.

James McMahon, NHDOT District 1, described the project and displayed draft impact plans to show the replacement of the existing 5'H x 7'W squash CMP with a 6'H x 10'W x 52'L concrete open bottom box with stream simulation. Jim further described in proposed inlet and outlet scour protection as well as the cobble-gravel fill to recreate the streambed at the offset alignment. Jim described safety concerns for the area, and proposes extension of the pipe at the inlet and installation of guardrail to improve safety. A photo depicted the existing pipe with the proposed box overlaid. Preliminary impacts are estimated as ~3,000sf for permanent to adjust for the new stream alignment at the inlet and outlet as well as bank stabilization, while temporary are approx. 400 sf for erosion control and regrading. Linear impacts are anticipated at left bank 1356', right bank 160' and channel 140'. Jim mentioned use of the previously disturbed area at the inlet will again be used for traffic bypass during construction. Work in the stream will be for stream simulation for the new pipe alignment. [Arin mentioned the slides provided ahead of the meeting have been revised to include a revised wetland impact plan. The plan shown at the meeting has removed the temporary impact area to the Palustrine Emergent Marsh potential PRA at the inlet from the traffic by-pass and has less impacts]

Jim also described the need for easements from the adjacent landowners, who are amendable to the easement for both construction and maintenance. He stated this project would aim to reuse previous traffic by-pass area and easements where able. Jim described site constraints as utility conflict needed for electric line relocation, who are agreeable to movement. He described this route as a well-used connector for travelers and commercial trucks seeking to travel between NH-110 in Milan and NH-16 in Dummer. This project is in preparation for scheduled road resurfacing in 2022. Design considerations aimed to improve the crossing by use of an open bottom crossing which improves connectivity with streambed simulation. The increased size will also increase capacity for a pipe which is currently undersized and overtops, as well as address the scouring and bank erosion currently seen at both the inlet and outlet of the existing structure. Jim explained the new alignment will more closely match the historic and natural alignment prior to the installation of the current crossing in 1986. The concrete box will support the high volume of logging truck traffic in the area and is also a cost effective replacement which can be completed by District forces. Jim showed the proposed stream profile throughout the proposed crossing, with streambed simulation. He stated the streambed material would address the existing deficiencies, to include the plunge pool and perch at the outlet. The proposed design will match the existing streambed profile at the edge of the easements and address deficiencies. Jim then showed the proposed road profile and again discussed the need to relocate an electrical pole within the project boundary. Jim briefly described the work plan and erosion

control, to include the use of the existing pipe as a clean water bypass during construction. He stated use of the one-way alternating traffic would make use of the previous by-pass used in the 1986 construction at the inlet side of the crossing. Good BMP's will be used throughout construction.

Jim provided the results of the hydraulics analysis, showing both the existing calculations, as well as the proposed open bottom proposed crossing design. The increase in flowable area will nearly double the capacity of the culvert. A reduction of the outlet velocity will also be seen. The proposed crossing is predicted to pass a 100 year storm event. Bank stabilization will include use of loam and vegetation over the stone. Depth and velocity calculation were shown.

Arin then described the results of the environmental review for the project. She described Cedar Brook as a 1st order stream, therefore not requiring protection under the Shoreland Water Quality Protection Act. StreamStats determined the crossing to be a Tier 3, with a drainage area of 2,012 acres. No Designated River within ¼ mile of the project. Cedar Brook is a predicted cold water stream per the Wildlife Action Plan (WAP). A Natural Heritage Bureau database review (NHB20-2969) determined no known occurrences. The Wetlands Permit Planning Tool GIS layer predicted a Bog Priority Resource Area (PRA) at the inlet, although no impacts to palustrine wetlands on the inlet are anticipated with the current proposed design. The WAP data did determine no Eastern Brook Trout or Species of Special Concern are known to occur in Cedar Brook. One dam at the outlet of Cedar Pond is active between the site and the [North Branch Upper] Ammonoosuc River. A review of the NH Fish & Game (NHF&G) Fish survey data determined no coldwater or state listed species are known in Cedar Brook, and Cedar Pond is actively stocked by NHF&G. No FEMA floodplain designation within the project limits. The stream assessment data of the reference reach determined a Rosgen's type 'C' with streambed material 15% sand/75%gravel/10%cobble. The average bankful width is 9.6' and depth of 1.3', with a compliant structure determined to be a 21' span. US Fish & Wildlife Service species list determined potential Canada lynx and Lothern long-eared bat. A field review determined no impact to habitat for Canada lynx primary food source, and therefore no anticipated effects. A 4(d) rule consistency determination was obtained for the project. Section 106 review for historic resources was complete, with no concerns for impacts.

Sarah commented the proposed design will not meet the NH Stream Crossing Guidelines recommended compliant structure span of 21' and NHDOT seeks approval for an alternative design under the 904.10 rules. Sarah also mentioned the off alignment replacement benefits include the wider span, streambed material simulation throughout, and vegetated banks. The proposed design will restore and improve the system from the existing conditions; narrowed channel at the inlet and large scour pool at the outlet caused by the undersized crossing. Mitigation will be about 1:1 for linear impacts and improvements that include self-mitigating design elements.

Karl asked the existing culvert length and Jim said 48'. Karl also mentioned the WPPT identified the wetland at the inlet as a bog and wants to ensure protection of this resource and to also field verify if it is a bog. Sarah did clarify a field survey was conducted and did determine the soils and plant species did not meet the criteria for a peatland adjacent to the impacts area. Karl mentioned the proposed contours and the need to tie into the existing grades, and ability to incorporate portions of the natural floodplain. Jim did explain cross sections will be included with the application, and does not intend to build channel higher than needed and will incorporate this recommendation. Karl also mentioned the potential for monitoring of the live stakes used for the bank stabilization and revegetation, and requests contours and phasing be included with the application.

Lori appreciated the removal of impacts to the PRA identified by the WPPT. She reviewed the linear measurements to the stream channel and questioned how the measurements were calculated. Jim clarified

the numbers provided are the longest and follow the sinuosity of the channel. Sarah did mention the line will be calculated as straight (as the crow flies) and Sarah did get 1:1 for impacts vs created based on her calculations. Lori would like to know what other additional planting will be used on the project and would like a post construction report and couple years of monitoring for bank revegetation. Lori thinks there may be a need for mitigation; Sarah will meet with DES to confirm mitigation needs prior to application submittal.

Carol appreciates removal of perch and improved connectivity. She confirmed the use of natural stream bottom throughout crossing, Jim confirmed that the design includes natural/ simulated streambed material through the crossing and within the stream channel impact areas. The site is upstream of Cedar Pond where there is a documented Loon nest; the site is a ¼ mile upstream of the Pond and therefore would not cause disturbance of Loon nesting.

Amy L does not have record of PRA (bog) nor the wetland being an exemplary natural community, or records of rare plants in area. She offered review of planting plans if needed. Chris M said Request for Project Review) RPR will be required, and Arin and Matt U said the internal cultural review and qualified for Appendix B of Programmatic Agreement and will be included with the application package. Canada lynx, no effect. Any trees >3" dbh being cut and Jim confirmed will at outlet. Arin confirmed consistency letter was obtained for the bat.

Jeanie had no comments. Pete S had question why a wider structure was not proposed to accommodate wildlife passage and meet geomorphic compatibility. Jim explained there is a flat shelf inside the box to accommodate wildlife passage in times of low flow. Phil T and Liz had no additional comments.

This project has not been previously discussed at the Monthly Natural Resource Agency Coordination Meeting.

Newton, #29617 (X-A004(206))

Hans Weber provided an introduction to the project. He explained that the project proposes improvements to the NH Route 108, Amesbury Road, and Maple Avenue-intersection in Newton, NH. This intersection is known as Rowe's Corner. He described the project schedule including the public informational meeting that was held in August 2020 and a proposed public hearing in spring 2021. H. Weber explained the project is needed to address the uncertainty for drivers that currently exists at the intersection. Currently NH Route 108 does not stop at the intersection, but Maple Avenue and Amesbury Road have stop signs. There is a flashing beacon in the intersection. Since Route 108 takes a distinct curve through the intersection and there are multiple slip ramps, the intersection can be confusing for drivers. H. Weber noted the crash history at the intersection.

Two alternatives had been considered for the intersection, a four way stop with elimination of the slip ramps and a roundabout. The Newton Select Board had indicated that the four-way stop is the preferred alternative, so the NHDOT is planning to pursue the four way stop as the preferred alternative.

H. Weber showed a preliminary plan for the four way stop (preferred) alternative, not including the culvert work. He explained that the green areas represents slope impacts (cuts and fills). Truck aprons are also proposed. H. Weber also explained that there is a culvert on Amesbury Road of unknown age that will be addressed as part of the project. Feedback is needed on the best alternative for replacement. Photos of the inlet and outlet of the culvert were shown. The culvert was not originally part of the Newton 29617 project. The Bureau of Environment and Maintenance (District) have encouraged that the culvert be addressed as part of the project due to its poor condition. The project budget cannot support a compliant sized structure,

so the team intends to apply for an alternative design. A water quality feature (BMP) is proposed in the bottom south east corner of the intersection, a conservation property. If the culvert were replaced, the impacts at the culvert outlet would also extend onto this Town owned conservation property. On the southern two quadrants, effort is being made to construct slopes with minimal impacts to wetlands.

The Amesbury Road culvert seems to have been extended with multiple materials. The date of construction and the original materials are unknown.

Rebecca Martin explained that the wetland delineation and stream crossing assessment were completed for the project. The Amesbury Road culvert is an unnamed Tier 2 stream. A compliant structure, which is not proposed, would be 13' wide. There is another crossing on NH Route 108 located west of the project area and upstream of the subject culvert (36" sliplined culvert) and upstream of that crossing is a private dam. The project does not propose any impacts to the culvert or dam upstream. R. Martin briefly described the types of wetlands in the project area, including palustrine forested and palustrine emergent/palustrine scrub shrub wetlands. She commented that the project area is in an MS4 community and stormwater treatment is planned. The Northern Long Eared Bat was identified as potentially being in the project area. R. Martin shared that the new Natural Heritage Bureau report includes the Spotted turtle and Blanding's turtle. She said that she initiated coordination with NH Fish and Game Department and recommendations will be taken into account during project design.

The quadrant where the stormwater treatment swale is proposed is located on Town owned conservation land. No LCHIP, LCIP/CLS, or LWCF funds were used to purchase the property. R. Martin has contacted the Conservation Commission to ask about the terms of the easement on the property, but hasn't received a response to date.

R. Martin described that the Wildlife Action Plan did not include any areas within the project area, but Green- highest ranked habitat in region and Orange- supporting landscape are located downstream of the Amesbury Road crossing. The Nature Conservancy's Connect the Coast effort did cover this area, but no corridors or habitat blocks are located in the project area.

H. Weber provided more details about the existing 48" equivalent diameter cast in place culvert under Amesbury Road that is proposed to be replaced. We are unclear on the exact size of the pipe, due to it being buried. District has been asked and has not informed the project team of any flooding issues. There are no floodplains or floodways mapped in the project area. The existing system would be expected to overtop the road at 55 cubic feet per second and the outlet velocity is 7.4 feet per second.

H. Weber explained that due to project constraints including the budget, right-of-way, and potential historic resources near the culvert, an alternative design is proposed. Two options are being considered and input about which would be preferred would be helpful moving forward. The first alternative, which seems to be preferred, is to replace the structure with a 60" embedded RCP with a 36" CMP overflow pipe, which would usually be dry and could function as a critter crossing. The second option is for twin 48" RCPs. Material would deposit in the pipes during storms and gradually over time and be transported through the culvert during high flows. There is some concern about the compaction between the 48" RCPs. H. Weber also mentioned that there is the option to do nothing and continue to try to maintain the current pipe. The 60" embedded RCP with a 36" CMP overflow pipe would overtop the road at 202 cubic feet per second, with an outlet velocity of 9.0 feet per second. The twin 48" pipes were modeled with no embedment and that system would overtop the road at 266 cubic feet per second, with an outlet velocity of 9.7 feet per second. A cross section of the 60" RCP plus 36" CMP was shown. It depicts some separation at the inlet (around 15 feet) with the outlets being close together in the existing channel.

Karl Benedict shared his comments on the project:

- According to 904.07, Tier 2 stream crossings must pass a 100-year storm event.
- Commented that the preferred alternative would be an alternative design.
- The preferred alternative fails to meet design criteria from the perspective of hydrology and geomorphology. * T. Mallette added for the minutes that this is in part because of an historic privately owned dam upstream.
- It would be challenging to permit the preferred option.
- He recommends a third hydraulically sized option be explored that accommodates the Ordinary High Water and the 100 year storm.
- Asked about 2:1 slopes in the southwest quadrant to minimize wetland impacts.
- Recommended reviewing AoT and MS4 compliance needs.

Tim Mallette shared some additional details of the hydraulic analysis, including that the design flows were based on information provided by the Dam Bureau from their recent breach analysis, which are very conservative. T. Mallette also commented on the bath tub like landscape at the culvert inlet and very organic sediment. He explained that the current design would be trying to keep up with the 36" sliplined culvert upstream under NH Route 108. He explained that a 100-year storm (estimated at approximately 226 cubic feet per second) could overtop NH Route 108 upstream. T. Mallette has shared that the 60" RCP with the 36" CMP will overtop Amesbury Road at approximately the 89 year storm event using 20" of embedment.

- T. Mallette noted (for the minutes) that for some projects in the past passing a 100-year storm has been interpreted to mean safely pass the event. That does not necessarily mean the road will not overtop – especially for areas that are ponding on both sides of the road with a relatively low head drop for a short duration. Culverts are designed for the 50 yr. event.

Lori Sommer shared her comments on the project:

- Concerned about Priority Resource Area for the State listed turtle species. R. Martin explained that the turtle records were a distance from the project area.
- Asked about an alternative location for the treatment swale; H. Weber explained why the other possible locations were not preferred due to the slope of the intersection, reducing wetland impacts and reducing ROW impacts.
- Commented that impacts on the conservation land may need to be coordinated with the Charitable Trust Bureau.
- Generally concerned about the size of the "preferred alternative" (60" RCP w/ 36" CMP overflow). She wonders if a third pipe might be dry more often and commented on turtle passage. T. Mallette explained that the crowns of the 60" and 36" pipe are currently matching, so the 36" structure would be dry until a little before the 10-year storm.

Carol Henderson shared her comments on the project:

- Commented that she has no concerns with the 4-way stop being the preferred alternative for the intersection.
- She commented that if AoT applies, it may be appropriate to complete a habitat survey in the project area. She mentioned the turtle species in the area.
- Suggested considering improved aquatic organism passage.
- She asked for new NHB number, which Amy Lamb provided as NHB21-0493.

Amy Lamb commented:

- No state listed plants or exemplary natural communities are in the project area.

Chris Marron:

- Began to express concern about clearing needed for construction, but R. Martin explained the NLEB FHWA Programmatic Agreement would apply and the project will probably be a Likely to Adversely Affect project.

Pete Steckler:

- Raised the issue of a flood mitigation report from 2016 that identified Newton's North Main Street as a flood risk area.
- Concerned about outlet erosion protection with the two different sized pipes and tying in the 36" pipe. Suggested considering how to stabilize the outlet without using angular riprap.
- Concerned about whether the outlet water could back up into overflow pipe and inhibit terrestrial passage through the intended dual purpose "critter pipe".

Tim Mallette agreed that no stone need be in the outlet pool. He said the outlet would be in the same pool where it is located now and the dissipation in the pool is adequate to reduce water velocities. He commented that he had seen catfish when he visited the stream. T. Mallette said that the invert outlet of the 36" CMP could be adjusted to keep it dry.

This project has not been previously discussed at the Monthly Natural Resource Agency Coordination Meeting.

Bow, #42704 (X-A004(950))

Chris Carucci gave an overview of the project, presented existing conditions data and discussed the proposed NR impacts. The project involves the rehabilitation of two corrugated metal pipe culverts (CMP) located under Interstate 89 NB and SB travel lanes just west of the crossing under Interstate 93 in the Town of Bow. The western culvert is a 292' long 48" diameter CMP that conveys an unnamed Tier 1 stream with a drainage area of 144.4 acres and outlets directly into the Turkey River. The eastern culvert is a 223' long 18" diameter CMP with a drainage area of 14 acres that acts as an equalizer pipe conveying stormwater runoff from a wetland on the south side of I-89 under the highway and outlets directly into the Turkey River. The eastern culvert is within the ¼ mile buffer of the Merrimack River. The goal of the project is to rehabilitate the culverts to prevent further deterioration so that they remain fully functional. The proposed method of rehabilitation will be sliplining the 48" CMP using a cured-in-place liner, and sliplining the 18" CMP with a 12" smooth interior pipe liner.

Karl Benedict opened the discussion by inquiring how bypassed water will be handled during construction for the 48" CMP. C. Carucci stated this will be up to the Contractor's Stormwater Pollution Prevention Plans (SWPPP) means and methods, but that stream flow could be pumped through the 48" pipe for most of the duration of work. He also stated the pipe would need to be dry for a short period of time, maybe only a few days, to install the liner and that they could allow for water to pond at the inlet since there is room depending on flows at that time. Any bypass water would need to be pumped to a dewatering basin/bag before outletting.

K. Benedict said that it would be good to aim for low flow periods and what is presented seems to be appropriate for managing water. He concurred with slip lining under Env-Wt 904.08 and Env-Wt 904.01 as long as AOP is met. The permitting path would be a single minor permit for the project (both culverts) because the work is rehabilitation, and impacts would be temporary, with no mitigation unless Lori says otherwise.

K. Benedict asked if the project is located in FEMA-mapped floodplain. C. Carucci stated yes but fill in the floodplain is not anticipated.

Lori Sommer noted the NHB Datacheck listed the state-threatened spotted turtle and state-species of special concern wood turtle and has a concern about impacts from the future Bow/Concord project as being cumulative to turtle habitat. Carol Henderson confirmed that the potential impacts to turtles or their habitat will need follow-up coordination with Kim Tuttle, NHF&G. C. Carucci responded that the current preferred alternative for the Bow-Concord project proposes significant changes to I-89 and ramps but does not impact the majority of the culvert barrels, the outlets, or the Turkey River. The inlet areas of the 48" and 18" cnp's would require some modification. Start of construction is estimated to be at least 10 years away. Kimberly Peace stated that we have worked with NHF&G to avoid impacts to turtles using their guidelines such as avoidance of the use of welded plastic or 'biodegradable plastic' netting or thread (e.g. polypropylene) in erosion control matting. L. Sommer stated no mitigation would be necessary pending NHB or NHF&G verification.

L. Sommer stated the project would need an AoT permit, which would include a wildlife assessment. Mark Hemmerlin stated that he was not sure that an AoT will be required, and this will be reviewed.

John Magee asked if it was possible to do something like the fish ramps that were installed in Warner to address AOP but noted that it is challenging here since the pipe is below certain river flows and velocities here can be high. C. Carucci stated the pipe that outlets into the Turkey River would be mitered/cut back and missing stone would be replaced to make the pipe flush with the bank which would return the area to the way it was originally. Sarah Large also noted that installing something would be a challenge in that the pipe/steam flows perpendicular to the flow of the Turkey River. J. Magee stated that it sounds like a good idea but requested a site visit to review the existing conditions. Meli Dube stated she would schedule a site visit.*

Amy Lamb stated she had no comments on the project as there are no plants or communities of concern.

Pete Steckler asked if the elevations would be conducive to combine these structures into one structure. C. Carucci stated that this would not be something that DOT would propose as part of a culvert rehabilitation project. This type of proposal would require abandoning a structure and realignment of the stream, and in this situation the crossings are too far apart and not hydraulically connected.

*Footnote: A site visit to review the 48" cnp outlet was held on March 3, 2021 with John Magee, and NHDOT personnel Meli Dube, Chris Carucci, Paul Metcalf, and Mike Strozewski. All agreed with the proposed concept, to trim off some of the 48" pipe to better match the existing riprap bank and reset some stones under and around the end of the pipe to eliminate the perch. Due to the difficulty in getting equipment down the very steep slope, it was suggested to use using smaller stone that could be hand placed and mortared in place. A sand bag 'cofferdam' or other approved method would be used to make sure no wet concrete ends up in the river.

This project has not been previously discussed at the Monthly Natural Resource Agency Coordination Meeting.

WETLAND DELINEATION, STREAM ASSESSMENT & INVASIVE PLANT SPECIES REPORT

**NH DOT PROJECT # 42704
I-89/I-93 INTERCHANGE
BOW, NEW HAMPSHIRE**

Prepared For:

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March 2021

SRE # 20-092

Wetland Delineation, Stream Assessment & Invasive Plant Species Report

**Hoyle, Tanner & Associates
NH DOT Project #42704
Bow, NH**

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Wetland Delineation, Stream Assessment & Invasive Plant Species Report

Introduction

Site Description:

Stoney Ridge Environmental, LLC. (SRE) conducted site work on December 4, 2020 and February 4, 2021 as requested by Hoyle, Tanner & Associates, Inc (HTA) for the NH DOT Project #42704 in Bow, NH. This wetland report provides an assessment of wetland functions and values, stream cross section assessment, and invasive species observed during site work for the above referenced project area. The project area is associated with the I-89/I-93 interchange in Bow, NH. The project area has been divided into four locations on site according to the HTA plans received. The northern side of I-89 northbound (NB) along the Turkey River makes up Area 1. South of the I-89 southbound (SB) off ramp to I-93 SB makes up Area 2 of the project. Area 3 is located between I-89 SB and the I-89 SB off ramp to I-93 SB. Area 4 of the project is located North of I-89 NB, between the on ramp and the Turkey River. The wetlands associated with the four project location areas can be found on the included Wetland Delineation, Stream Cross Section and Invasive Plant Species Plan.



Looking south at Wetland B3 from the Recreation Trail.

Methods

Site work was completed utilizing the current NH DES delineation standards in addition to the following standards:

- 1) United States Department of Agriculture, Natural Resources Conservation Service. 2016. *Field Indicators of Hydric Soils in the United States*, Version 8.2. L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.
- 2) *Field Indicators for Identifying Hydric Soils In New England*. Version 4. April 2019. New England Hydric Soils Technical Committee.
- 3) *North American Digital Flora: National Wetland Plant List, version 2.1.0* (http://wetland_plants.usace.army.mil). U.S. Army Corps of Engineers, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH, and BONAP, Chapel Hill.
- 4) *The National Wetland Plant List: 2016 wetland ratings*. Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *Phytoneuron* 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X.
- 5) *Corps of Engineers Wetlands Delineation Manual*. January 1987. Wetlands Research Program Technical Report Y-87-1.
- 6) *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region*. January 2012, version 2. U.S. Army Corps of Engineers. Environmental Laboratory ERDC/EL TR-12-1.
- 7) *Classification of Wetlands and Deepwater Habitats of the United States*. December 1979. L. Cowardin, V. Carter, F. Golet, and E. LaRoe. US Department of the Interior. Fish and Wildlife Service. FWS/OBS-79/31.
- 8) *The Highway Methodology Workbook Supplemental*. US Army Corps of Engineers New England Division. USACE 1999.
- 9) *Best Management Practices for the Control of Invasive and Noxious Plant Species*: 2018. New Hampshire Department of Transportation.
- 10) New Hampshire Department of Environmental Services, *Wetlands Permit Planning Tool* (WPPT), http://des3.sr.unh.edu/Html5Viewer/Index.html?configBase=http://jointagencyvm.sr.unh.edu/Geocortex/Essentials/des3.sr.unh.edu/REST/sites/Tom_Scratch_Site/viewers/Scratch/virtualdirectory/Resources/Config/Default.

During the site work, SRE delineated wetlands, completed two USACE data plots, assessed wetland functions & values, completed one stream assessment and located invasive plant species as outlined in the 2018 version of the NH DOT “Best Management Practices for the Control of Invasive and Noxious Plant Species”. Arctic pink flagging was utilized to demarcate wetlands in the field and were hung at appropriate distances as necessary to clearly define the edge of wetland. SRE delineated the NHDES Wetlands Bureau ‘Top of Bank’ (TOB) and the ‘Ordinary High Watermark’ (OHW) along the Turkey River within the project area. Red and white striped flagging was used to demarcate the TOB locations, and OHW locations were GPS located while on site. In addition to the delineations, SRE also marked and surveyed invasive plants. SRE hung pink flags labeled ‘Invasive Plant’ where applicable. A discussion of the invasive plant species observed within the project area is

included later in this report. The GPS surveyed locations of the invasive species can be found on the included Wetland Delineation, Stream Cross Section & Invasive Plant Species Plan.

SRE GPS located all flagging using a LT400 Handheld GPS & A110G External Receiver, Serial Number 420059 & 12060752. This GPS unit has sub-meter resolution.

Functional Assessment

The functions and values for the wetlands associated with the project were assessed by SRE on January 14, 2021 using the Army Corps of Engineers' Highway Methodology Workbook Supplement (Appendix A, USACE, September 1999). Wetlands were classified by SRE utilizing the criteria outlined in the "Classification of Wetlands and deepwater Habitats of the United States" (Cowardin et al. 1978). Functions and values were assessed for the wetlands include: groundwater recharge/discharge, floodflow alteration, fish and shellfish habitat, sediment/toxicant retention, nutrient removal, production export, sediment/shoreline stabilization, wildlife habitat, recreation, educational/scientific value, uniqueness/heritage, visual quality/aesthetics and endangered species habitat. Wetland functions are considered to be principal if they are an important physical component of a wetland system. Wetland values are considered to be principal if they are of special value to society, from a local, regional and/or national perspective. The rationale for the assigned functions and values for each wetland system is shown on the included Wetland Function-Value Evaluation Forms.

Discussion

Wetland System A

Wetland A Description

This wetland system is located along Valley Rd. and the NH DOT multi-use recreation path. This system is predominantly classified as Palustrine Shrub-Scrub Broad-Leaved Deciduous Seasonally Flooded/Saturated (PSS1E) and Palustrine Shrub-Scrub Broad-Leaved Deciduous Seasonally Flooded/Saturated Excavated (PSS1Ex). The system also contains a tier 1 intermittent stream classified as Riverine Intermittent Streambed Rubble/Sand Excavated (R4SB2/4x). Soils within the wetland are poorly drained. The dominant vegetation within the wetland system is characterized by *Cornus sericea* (red-osier dogwood), *Salix nigra* (black willow), *Vaccinium corymbosum* (highbush blueberry) and *Onoclea sensibilis* (sensitive fern) with multiple other non-dominant hydrophytic plants present. Hydrology within the wetland is primarily influenced by the intermittent stream and overland runoff from the surrounding uplands.

Assessment of Wetland A Functions and Values

Wetland A is a small wetland system bordering an intermittent stream. Due to the relatively small size of the wetland, and evidence of extensive disturbance, including excavation and surrounding land use, the wetland has low functions and values. The wetland does serve as a recharge or discharge site as it receives runoff from the surrounding developed areas, as well as the intermittent stream system. The system is located between residential lots along Valley Rd. and the recreation trail bordering the I-89 off ramp to I-93 SB. The wetland shows signs of excavation, as well as channelization of the intermittent stream, before it enters the culvert within the wetland. See the included Function & Value Form for rationale and additional comments.



General view of Wetland A looking southeast and up the intermittent stream.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: I-89/I-93 Interchange Bow City/County: Bow/Merrimack Sampling Date: 12.4.20
 Applicant/Owner: Hoyle, Tanner & Associates, Inc./NH DOT Project #42704 State: NH Sampling Point: Wetland A
 Investigator(s): Justin Sherman, Diane DeVrise Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Slight Slope Local relief (concave, convex, none): Slight Concave Slope (%): ~5
 Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____
 Soil Map Unit Name: _____ NWI classification: PSS1E/1Ex

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes No _____
 Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____ If yes, optional Wetland Site ID: <u>Wetland A</u>
Remarks: (Explain alternative procedures here or in a separate report.) 	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input type="checkbox"/> Surface Water (A1) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) <input checked="" type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Aquatic Fauna (B13) <input checked="" type="checkbox"/> Saturation (A3) <input type="checkbox"/> Marl Deposits (B15) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Sediment Deposits (B2) <input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)	<u>Secondary Indicators (minimum of two required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input checked="" type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
--	---

Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>9.0</u> Saturation Present? Yes <input checked="" type="checkbox"/> No _____ Depth (inches): <u>1.0</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____
---	---

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
 Hydrological indicators A2, A3, B9, C3 & B10 present. Parameter is met.

VEGETATION – Use scientific names of plants.

Sampling Point: Wetland A-Wet

Tree Stratum (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. <i>Betula populifolia</i>	15	Y	FAC
2. <i>Acer rubrum</i>	15	Y	FAC
3. <i>Ulmus americana</i>	5	N	FACW
4. <i>Populus grandidentata</i>			FACU
5. _____			
6. _____			
7. _____			
35 = Total Cover			
Sapling/Shrub Stratum (Plot size: <u>15'</u>)			
1. <i>Betula populifolia</i>	10	N	FAC
2. <i>Vaccinium corymbosum</i>	25	Y	FACW
3. <i>Cornus alba</i>	30	Y	FACW
4. <i>Ilex verticillata</i>	25	Y	FACW
5. _____			
6. _____			
7. _____			
90 = Total Cover			
Herb Stratum (Plot size: <u>5'</u>)			
1. <i>Onoclea sensibilis</i>	85	Y	FACW
2. <i>Toxicodendron radicans</i>	10	N	FAC
3. <i>Cornus alba</i>	30	N	FACW
4. <i>Symplocarpus foetidus</i>	5	N	OBL
5. <i>Rosa rugosa</i>	2	N	FACU
6. <i>Solidago rugosa</i>	3	N	FAC
7. <i>Equisetum spp.</i>	30	N	
8. <i>Symphytotrichum lanceolatum</i>	3	N	FACW
9. _____			
10. _____			
11. _____			
12. _____			
168 = Total Cover			
Woody Vine Stratum (Plot size: _____)			
1. _____			
2. _____			
3. _____			
4. _____			
_____ = Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____	(A) _____ (B)
Prevalence Index = B/A = _____	

- Hydrophytic Vegetation Indicators:**
- 1 - Rapid Test for Hydrophytic Vegetation
 - 2 - Dominance Test is >50%
 - 3 - Prevalence Index is ≤3.0¹
 - 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
 - Problematic Hydrophytic Vegetation¹ (Explain)
- ¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes No

Remarks: (Include photo numbers here or on a separate sheet.)
 Greater than 50% FAC or wetter, parameter is met.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: I-89/I-93 Interchange Bow City/County: Bow/Merrimack Sampling Date: 12.4.20
 Applicant/Owner: Hoyle, Tanner & Associates, Inc./NH DOT Project #42704 State: NH Sampling Point: Upland A
 Investigator(s): Justin Sherman, Diane DeVrise Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): None Slope (%): ~10
 Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____
 Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes No _____
 Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/> Hydric Soil Present? Yes _____ No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/> If yes, optional Wetland Site ID: _____
Remarks: (Explain alternative procedures here or in a separate report.)	

HYDROLOGY

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)	Secondary Indicators (minimum of two required)
<input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Aquatic Fauna (B13) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Marl Deposits (B15) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)	<input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)

Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ (includes capillary fringe)	Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>
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Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
 No hydrological indicators observed. Parameter is not met.

VEGETATION – Use scientific names of plants.

Sampling Point: Upland A

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. <u>Pinus strobus</u>	80	Y	FACU	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>25%</u> (A/B)	
2. <u>Acer rubrum</u>	10	N	FAC		
3. <u>Ulmus americana</u>	5	N	FACW		
4. <u>Fagus grandifolia</u>	5	N	FACU		
5. <u>Betula pendula</u>	15	N	FACU		
6. _____					
7. _____					
	115	= Total Cover		Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>15'</u>)					
1. <u>Acer rubrum</u>	20	Y	FAC		
2. _____					
3. _____					
4. _____					
5. _____					
6. _____					
7. _____					
	20	= Total Cover			
Herb Stratum (Plot size: <u>5'</u>)					
1. <u>Acer rubrum</u>	15	Y	FACU	Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
2. <u>Quercus alba</u>	10	N	FACU		
3. <u>Forsythia Vahl</u>	10	N			
4. <u>Vaccinium angustifolium</u>	20	Y	FACU		
5. <u>Hamamelis virginiana</u>	10	N	FACU		
6. <u>Dryopteris intermedia</u>	5	N	FACU		
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
12. _____					
	70	= Total Cover			
Woody Vine Stratum (Plot size: _____)					
1. _____				Definitions of Vegetation Strata: Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vines – All woody vines greater than 3.28 ft in height.	
2. _____					
3. _____					
4. _____					
				Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>	

Remarks: (Include photo numbers here or on a separate sheet.)
 Less than or equal to 50% FAC or wetter vegetation. The parameter is not met.

Wetland Function-Value Evaluation Form

Total area of wetland Unknown Human made? Yes/No Is wetland part of a wildlife corridor? No or a "habitat island"? No

Adjacent land use Commercial/Residential/Highway Distance to nearest roadway or other development ~50 ft.

Dominant wetland systems present PSS1E/Ex. PEM1Ex. R4SB2/4x Contiguous undeveloped buffer zone present No

Is the wetland a separate hydraulic system? No If not, where does the wetland lie in the drainage basin? Lower

How many tributaries contribute to the wetland? Wildlife & vegetation diversity/abundance (see attached list)

Wetland I.D. Wetlands A, B1, B2
 Latitude Longitude
 Prepared by: CB, JS Date 1/14/21
 Wetland Impact:
 Type Area

Evaluation based on:

Office Field

Corps manual wetland delineation completed? Y N

Suitability Y / N Rationale (Reference #)* Principal Function(s)/Value(s)

	Groundwater Recharge/Discharge	Y	1, 2, 3, 4, 5, 7, 9	Wetland A contains the intermittent stream. Hydrology is provided by the stream, runoff from the surrounding highways and seep. Water will flow through these systems functioning as a discharge site. The topography and soils will allow for recharge.
	Floodflow Alteration	Y	3, 5, 8, 9, 13, 15	These wetlands have minor suitability for floodwater storage. The topographic depressional portions of the wetland can retain some excess water. The intermittent stream will reduce water retention as it will facilitate transport. The outlet of wetland A is constricted by the culvert, and may extend retention times during large storms
	Fish and Shellfish Habitat	N	1, 8, 17	There is a stream system however the outlet is a culvert blocking aquatic passage. The stream is intermittent, and fed via wetland drainage and overland sheetflow, may have dry periods. The water depth is not sufficient enough to support fish or shellfish.
	Sediment/Toxicant Retention	Y	1, 2, 3, 4, 6, 8, 10, 16	The wetland borders around the stream, and depressional pockets have some water retention and sediment trapping potential. This area is small compared to the whole system. Drainage entering from the surrounding highways have the potential to contain sediment and toxicants. The stream limits retention times.
	Nutrient Removal	Y	3, 4, 6, 7, 8, 9, 10, 11, 13	Some nutrient removal may occur in the depressional pockets and poorly drained portion of the wetland. Dense vegetation occurs, and may help to utilize nutrients.
	Production Export	N	2, 7	Wetland contains no useable products.
	Sediment/Shoreline Stabilization	N	1, 2, 3, 4, 6, 9, 12, 15	The stream has been channelized with stone blocks, most vegetation is overhanging the channel. Due to the narrow channelized portion, flow velocity may increase in storm events
	Wildlife Habitat	N	6, 13	The wetland area is small and surrounded by development and the I-89/I-83 highways, limiting access. The wetlands are also surrounded by 5 ft. tall fencing, that will limit wildlife use. Minor avian use may occur, however shrub and tree cover diversity is lacking. Wetland has potential for insect populations in standing water.
	Recreation	N	10	The wetland has no public access, it is located on private land, and within the highway interchange. Although the wetland can be viewed from the recreation trail, there is no access. The border fence blocks access to the wetland.
	Educational/Scientific Value	N	8	The wetland has no public access, it is located on private land, and within the highway interchange. Although the wetland can be viewed from the recreation trail, there is no access. The border fence blocks access to the wetland. Surrounding highways are hazardous
	Uniqueness/Heritage	N	1, 9, 12, 13, 17, 19, 23	Wetland has no public access due to the fence bordering the recreation trail. The wetland can be viewed from the trail, but not accessed.
	Visual Quality/Aesthetics	N	1, 3, 6,	The wetland can only be viewed from the recreation trail and is separated by the border fence. The highway detracts from the aesthetics
ES	Endangered Species Habitat	N		No endangered species were observed while on site.
Other				

Notes:

These wetlands are small relative to the site. The system has been extensively modified and excavated. The stream has also been channelized with stone blocks. Although portions of the wetland can be observed from the recreation trail, there is no access due to the fence bordering it. The wetlands are not visually appealing, with garbage and large amounts of invasive species.

*** Refer to backup list of numbered considerations.**

Wetland System B1, B2 & B3

Wetland System B1 & B2 Description

Wetland system B is comprised of four wetlands, connected via culverts on site. Wetlands B1 and B2 are classified as, Palustrine Emergent Persistent Seasonally Flooded/Saturated Excavated (PEM1Ex) and Wetland B3 is classified as Palustrine Emergent Persistent Semipermanently Flooded (PEM1F). The two PEM1Ex wetlands included in Wetland B1 are located on the south side of the I-89 off ramp to I-93 SB are narrow, excavated drainage ditches bordering the paved recreation trail. These two wetlands drain into catch basins before being directed to a culvert underneath the off ramp to feed into Wetland B2. Wetland B2 is a shallow excavated pocket that receives drainage from two culverts. This wetland shows signs of excavation and alteration, bordered by fill and grading for the highway and recreation trail. From B2, water is directed through a culvert and into Wetland B3. The dominant vegetation within these two wetlands is *Lythrum salicaria* (purple loosestrife), *Typha latifolia* (broad leaf cattail) and *Juncus effusus* (soft rush). Hydrology within these wetlands is provided by sheet flow, seep from the roadway slopes and drainage from the surrounding highway catch basins. These wetlands are highly impacted, and showed signs of sedimentation from the surrounding drainage outlets. The soils within these wetlands are poorly drained and saturated.



A view of Wetlands B1, the PEM1Ex drainage ditches along the recreation trail.

Wetland System B3 Description

Wetland B3 is the largest of the systems on site, located within the clover of the I-89 SB off ramp to I-93 SB, and the I-89 SB lane. This wetland can be classified as Palustrine Emergent Persistent Semipermanently Flooded (PEM1F). The wetland is situated at the base of the slopes for the adjacent highways, and connected to Wetland B2. This wetland also features a 18" CMP connecting to the

Turkey River. The soils within the wetland were very poorly drained fine sandy loam/sandy loams. Vegetation within the wetland was dominated by broad leaf cattail, purple loosestrife and *Phragmites australis* (common reed grass). Hydrology within the wetland is primarily due to a high seasonal water table, overland sheet flow, and drainage directed to the wetland. As the wetland sits in a deep depressional area, surrounded by the steep slopes of the highway, water is retained for long periods of time. This was observed in the formation of the deep organic hydric soils (21-40+ inches) that were fully saturated and meet the histosol and hydrogen sulfide indicators.

Assessment of Wetland B Functions and Values

Wetlands B1 and B2 are primarily located adjacent to the highway and show signs of excavation and historical impact. These wetlands have low-level functions and values as they are small in size, have been manipulated/excavated, are in close proximity to I-89 and lack suitable wildlife habitat and plant diversity. The most significant function of these wetlands is that they likely receive runoff with excess sediments and toxicants from the surrounding highway. These wetlands will be able to store and retain the runoff they receive. They also function minimally as groundwater recharge locations, serving as water retention for the drainage directed to them from I-89. These wetlands drain into Wetland B3, which has higher functions and values.



Wetland B3 is the highest functioning wetland in the project area. It has suitable functions for groundwater recharge, floodflow alteration and sediment toxicant retention. As the wetland area is large in comparison to the project area, and contains deep organic, very poorly drained soils it has the ability to retain significant amounts of water and function as a groundwater recharge site. Although the outlet to the Turkey River is constricted and connected via culvert, it also has the potential to receive and store excess flood waters if the Turkey were to rise. The wetland also receives waters directed to it from Wetland B2 and multiple catch basins and drainages from the surrounding highway interchange. The deep organic soils and dense vegetation will also aid in sediment and toxicant retention. Although the wetland does have suitable functions, its location and disturbed nature within the highway interchange reduces value. It can be observed from the recreation trail that abuts it; however surrounding views, and the proximity of the highway also reduce the value.



This is a view of the organic soils within Wetland B3.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: I-89/I-93 Interchange Bow City/County: Bow/Merrimack Sampling Date: 12.4.20
 Applicant/Owner: Hoyle, Tanner & Associates, Inc./NH DOT Project #42704 State: NH Sampling Point: Wetland B3
 Investigator(s): Justin Sherman, Diane DeVrise Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 0
 Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____
 Soil Map Unit Name: _____ NWI classification: PEM1F

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
 Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____
 Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u>X</u> No _____ Hydric Soil Present? Yes <u>X</u> No _____ Wetland Hydrology Present? Yes <u>X</u> No _____	Is the Sampled Area within a Wetland? Yes <u>X</u> No _____ If yes, optional Wetland Site ID: <u>Wetland B3</u>
Remarks: (Explain alternative procedures here or in a separate report.) 	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input checked="" type="checkbox"/> Surface Water (A1) <input checked="" type="checkbox"/> Water-Stained Leaves (B9) <input checked="" type="checkbox"/> High Water Table (A2) _____ Aquatic Fauna (B13) <input checked="" type="checkbox"/> Saturation (A3) _____ Marl Deposits (B15) _____ Water Marks (B1) <input checked="" type="checkbox"/> Hydrogen Sulfide Odor (C1) _____ Sediment Deposits (B2) _____ Oxidized Rhizospheres on Living Roots (C3) _____ Drift Deposits (B3) _____ Presence of Reduced Iron (C4) _____ Algal Mat or Crust (B4) _____ Recent Iron Reduction in Tilled Soils (C6) _____ Iron Deposits (B5) _____ Thin Muck Surface (C7) <input checked="" type="checkbox"/> Inundation Visible on Aerial Imagery (B7) _____ Other (Explain in Remarks) _____ Sparsely Vegetated Concave Surface (B8)	<u>Secondary Indicators (minimum of two required)</u> _____ Surface Soil Cracks (B6) <input checked="" type="checkbox"/> Drainage Patterns (B10) _____ Moss Trim Lines (B16) _____ Dry-Season Water Table (C2) _____ Crayfish Burrows (C8) _____ Saturation Visible on Aerial Imagery (C9) _____ Stunted or Stressed Plants (D1) _____ Geomorphic Position (D2) _____ Shallow Aquitard (D3) _____ Microtopographic Relief (D4) _____ FAC-Neutral Test (D5)
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Field Observations: Surface Water Present? Yes <u>X</u> No _____ Depth (inches): <u>0</u> Water Table Present? Yes <u>X</u> No _____ Depth (inches): <u>0</u> Saturation Present? Yes <u>X</u> No _____ Depth (inches): <u>0</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <u>X</u> No _____
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Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
 Hydrological indicators A1, A2, A3, B7, B9, C1 & B10 present. Parameter is met.

VEGETATION – Use scientific names of plants.

Sampling Point: Wetland B3-Wet

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30'</u>)				
1. <u><i>Acer rubrum</i></u>	<u>5</u>	Y	FAC	
2. _____				
3. _____				
4. _____				
5. _____				
6. _____				
7. _____				
	<u>5</u>	= Total Cover		
Sapling/Shrub Stratum (Plot size: <u>15'</u>)				
1. <u><i>Vaccinium corymbosum</i></u>	<u>5</u>	Y	FACW	
2. <u><i>Ilex verticillata</i></u>	<u>10</u>	Y	FACW	
3. _____				
4. _____				
5. _____				
6. _____				
7. _____				
	<u>15</u>	= Total Cover		
Herb Stratum (Plot size: <u>5'</u>)				
1. <u><i>Typha latifolia</i></u>	<u>90</u>	Y	OBL	
2. <u><i>Panicum virgatum</i></u>	<u>10</u>	N	FAC	
3. <u><i>Phalaris arundinacea</i></u>	<u>5</u>	N	FACW	
4. <u><i>Schoenoplectus tabernaemontani</i></u>	<u>2</u>	N	OBL	
5. _____				
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
11. _____				
12. _____				
	<u>107</u>	= Total Cover		
Woody Vine Stratum (Plot size: _____)				
1. _____				
2. _____				
3. _____				
4. _____				
		= Total Cover		

Dominance Test worksheet:
 Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
 Total Number of Dominant Species Across All Strata: 4 (B)
 Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by: _____
 OBL species _____ x 1 = _____
 FACW species _____ x 2 = _____
 FAC species _____ x 3 = _____
 FACU species _____ x 4 = _____
 UPL species _____ x 5 = _____
 Column Totals: _____ (A) _____ (B)
 Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:
 1 - Rapid Test for Hydrophytic Vegetation
 2 - Dominance Test is >50%
 3 - Prevalence Index is ≤3.0¹
 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
 Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:
Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.
Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.
Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.
Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes No

Remarks: (Include photo numbers here or on a separate sheet.)
 Greater than 50% FAC or wetter, parameter is met.

SOIL

Sampling Point: Wetland B3-Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-12	10 YR 2/2						FSL	Muck/Unconsolidated/Saturated
12-17	7.5 YR 4/2	40	7.5 Y 4/4	60	C	M	FSL	High organic
17-21+	2.5 Y 2.5/1				C	M	SL	High organic, fibric

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:		Indicators for Problematic Hydric Soils³:	
<input checked="" type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Polyvalue Below Surface (S8) (LRR R, MLRA 149B)	<input type="checkbox"/> 2 cm Muck (A10) (LRR K, L, MLRA 149B)	
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Thin Dark Surface (S9) (LRR R, MLRA 149B)	<input type="checkbox"/> Coast Prairie Redox (A16) (LRR K, L, R)	
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Loamy Mucky Mineral (F1) (LRR K, L)	<input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) (LRR K, L, R)	
<input checked="" type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Dark Surface (S7) (LRR K, L)	
<input type="checkbox"/> Stratified Layers (A5)	<input type="checkbox"/> Depleted Matrix (F3)	<input type="checkbox"/> Polyvalue Below Surface (S8) (LRR K, L)	
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Redox Dark Surface (F6)	<input type="checkbox"/> Thin Dark Surface (S9) (LRR K, L)	
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Depleted Dark Surface (F7)	<input type="checkbox"/> Iron-Manganese Masses (F12) (LRR K, L, R)	
<input type="checkbox"/> Sandy Mucky Mineral (S1)	<input type="checkbox"/> Redox Depressions (F8)	<input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 149B)	
<input type="checkbox"/> Sandy Gleyed Matrix (S4)		<input type="checkbox"/> Mesic Spodic (TA6) (MLRA 144A, 145, 149B)	
<input type="checkbox"/> Sandy Redox (S5)		<input type="checkbox"/> Red Parent Material (F21)	
<input type="checkbox"/> Stripped Matrix (S6)		<input type="checkbox"/> Very Shallow Dark Surface (TF12)	
<input type="checkbox"/> Dark Surface (S7) (LRR R, MLRA 149B)		<input type="checkbox"/> Other (Explain in Remarks)	

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):	Hydric Soil Present? Yes <u>X</u> No <u> </u>
Type: _____ Depth (inches): _____	

Remarks:
 Very deep organic soil, saturated from the surface. Hydric soil indicator A1 & A4 present. Parameter is met.

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: I-89/I-93 Interchange Bow City/County: Bow/Merrimack Sampling Date: 12.4.20
 Applicant/Owner: Hoyle, Tanner & Associates, Inc./NH DOT Project #42704 State: NH Sampling Point: Upland B3
 Investigator(s): Justin Sherman, Diane DeVrise Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): Slight slope Slope (%): 10
 Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____
 Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
 Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____
 Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No <u>X</u>	Is the Sampled Area within a Wetland? Yes _____ No <u>X</u>
Hydric Soil Present? Yes _____ No <u>X</u>	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present? Yes _____ No <u>X</u>	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:	Secondary Indicators (minimum of two required)
<u>Primary Indicators (minimum of one is required; check all that apply)</u>	_____ Surface Soil Cracks (B6)
_____ Surface Water (A1)	_____ Drainage Patterns (B10)
_____ High Water Table (A2)	_____ Moss Trim Lines (B16)
_____ Saturation (A3)	_____ Dry-Season Water Table (C2)
_____ Water Marks (B1)	_____ Crayfish Burrows (C8)
_____ Sediment Deposits (B2)	_____ Saturation Visible on Aerial Imagery (C9)
_____ Drift Deposits (B3)	_____ Stunted or Stressed Plants (D1)
_____ Algal Mat or Crust (B4)	_____ Geomorphic Position (D2)
_____ Iron Deposits (B5)	_____ Shallow Aquitard (D3)
_____ Inundation Visible on Aerial Imagery (B7)	_____ Microtopographic Relief (D4)
_____ Sparsely Vegetated Concave Surface (B8)	_____ FAC-Neutral Test (D5)
_____ Water-Stained Leaves (B9)	
_____ Aquatic Fauna (B13)	
_____ Marl Deposits (B15)	
_____ Hydrogen Sulfide Odor (C1)	
_____ Oxidized Rhizospheres on Living Roots (C3)	
_____ Presence of Reduced Iron (C4)	
_____ Recent Iron Reduction in Tilled Soils (C6)	
_____ Thin Muck Surface (C7)	
_____ Other (Explain in Remarks)	

Field Observations:	Wetland Hydrology Present? Yes _____ No <u>X</u>
Surface Water Present? Yes _____ No <u>X</u> Depth (inches): _____	
Water Table Present? Yes _____ No <u>X</u> Depth (inches): _____	
Saturation Present? Yes _____ No <u>X</u> Depth (inches): _____ (includes capillary fringe)	

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
 No hydrological indicators observed. Parameter is not met.

VEGETATION – Use scientific names of plants.

Sampling Point: Upland B3

	Absolute % Cover	Dominant Species?	Indicator Status		
Tree Stratum (Plot size: <u>30'</u>)					
1. <u>Pinus strobus</u>	60	Y	FACU	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>7</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>14%</u> (A/B)	
2. <u>Quercus alba</u>	40	Y	FACU		
3. <u>Acer rubrum</u>	10	N	FAC		
4. _____					
5. _____					
6. _____					
7. _____					
	<u>110</u>	= Total Cover		Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____	
Sapling/Shrub Stratum (Plot size: <u>15'</u>)					
1. <u>Acer rubrum</u>	10	Y	FAC		
2. <u>Pinus strobus</u>	5	Y	FACU		
3. <u>Quercus alba</u>	3	N	FACU		
4. <u>Elaeagnus umbellata</u>	5	Y	NI		
5. _____					
6. _____					
7. _____					
	<u>23</u>	= Total Cover			
Herb Stratum (Plot size: <u>5'</u>)					
1. <u>Festuca rubra</u>	80	Y	FACU	Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
2. <u>Andropogon virginicus</u>	5	N	FACU		
3. <u>Panicum virgatum</u>	5	N	FAC		
4. <u>Solidago canadensis</u>	5	N	FACU		
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
12. _____					
	<u>95</u>	= Total Cover			
Woody Vine Stratum (Plot size: <u>30'</u>)					
1. <u>Vitis labrusca</u>	5	Y	FACU	Definitions of Vegetation Strata: Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vines – All woody vines greater than 3.28 ft in height.	
2. _____					
3. _____					
4. _____					
	<u>5</u>	= Total Cover			
Hydrophytic Vegetation Present? Yes _____ No <input checked="" type="checkbox"/>					

Remarks: (Include photo numbers here or on a separate sheet.)
 Less than or equal to 50% FAC or wetter vegetation. The parameter is not met.

Wetland Function-Value Evaluation Form

Wetland I.D. Wetland B3
 Latitude _____ Longitude _____
 Prepared by: CB, JS Date 1/14/21
 Wetland Impact: _____ Area _____
 Evaluation based on:
 Office Field
 Corps manual wetland delineation completed? Y N

Total area of wetland Unknown Human made? Yes/No Is wetland part of a wildlife corridor? No or a "habitat island"? No
 Adjacent land use Highway Distance to nearest roadway or other development ~50 ft.
 Dominant wetland systems present PEMIF Contiguous undeveloped buffer zone present No
 Is the wetland a separate hydraulic system? No If not, where does the wetland lie in the drainage basin? Lower
 How many tributaries contribute to the wetland? _____ Wildlife & vegetation diversity/abundance (see attached list)

Function/Value	Suitability Y / N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
Groundwater Recharge/Discharge	Y	1, 2, 3, 4, 5, 7, 9		This wetland contains VPD soils that can facilitate recharge
Floodflow Alteration	Y	3, 4, 5, 6, 7, 8, 9, 13, 15, 18	Y	Wetland contains VPD soils, and topographical depression that will retain excess waters. The wetland also receives drainage waters from the surrounding highway. In the event of a flood the wetland may receive flood waters from the Turkey River
Fish and Shellfish Habitat	N			The wetland is attached to the Turkey River via culvert. Fish and shellfish habitat is not present in the wetland.
Sediment/Toxicant Retention	Y	1, 2, 3, 4, 5, 6, 8, 9, 10, 13, 16	Y	The VPD soils and depressional topography will facilitate water retention and sediment trapping. The culvert forms a restricted outlet, increasing retention time. The wetland receives runoff from the surrounding highway and wetland B2. Drainage enters from the surrounding highways has the potential to contain sediment and toxicants.
Nutrient Removal	Y	3, 4, 5, 6, 7, 8, 9, 10, 13, 14		The wetland contains VPD deep organic soils, and dense vegetation that will facilitate nutrient removal. The restricted outlet increases water retention time.
Production Export	N	2, 7		No usable products or actively available in wetland.
Sediment/Shoreline Stabilization	N	3, 5		The wetland is not a stream system. It outlets into the Turkey River through a culvert
Wildlife Habitat	N	6, 13, 19, 20, 21		The vegetation within the wetland is dense, but not diverse. It is located within the highway interchange, which will limit wetland access to the wetland. The wetland is semi-permanently flooded which may facilitate amphibian and insect populations
Recreation	N	10		The wetland is located on private land, and within the highway interchange. The wetland can be viewed from the recreation trail, but access and use within the wetland is not available.
Educational/Scientific Value	N	8		The wetland is located on private land, and within the highway interchange. The area is disturbed and lacks vegetation diversity. The proximity of the highway reduces value.
Uniqueness/Heritage	N	1, 9, 13, 17, 19		The wetland is located on private land, and within the highway interchange. The area is disturbed and lacks vegetation diversity. The proximity of the highway reduces value. The wetland can be viewed from the recreation trail, but access and use within the wetland is not available.
Visual Quality/Aesthetics	N	2, 6, 9, 12		The wetland can be viewed from the recreation trail. The proximity to the highway detracts from the aesthetics of the wetland.
Endangered Species Habitat	N			No endangered species were observed while on site.
Other				

Notes:
 The wetland contains deep organic VPD soils that can retain large amounts of water. Runoff and drainage is directed to the wetland from the surrounding highways as it is large and has the ability to hold excess water. The dense vegetation adds detritus and will facilitate sediment retention and nutrient attenuation. The restricted outlet will also increase water retention time, allowing for sediment removal. Although the wetland can be observed from the recreation trail, there is no access within the wetland. The wetland is visually appealing, but the surrounding highway and disturbance reduces the visual appeal. The wetland also contains a large amount of invasive species, *** Refer to backup list of numbered considerations.**
 Abbreviations and symbols: [https://www.fws.gov/wetlands/abbreviations-and-symbols](#)

Wetland C

Wetland C Description

Wetland C is a small, isolated Palustrine Emergent Persistent Seasonally Flooded/Saturated (PEM1E) pocket on the northwest side of the I-89 on ramp from I-93. This isolated wetland borders the I-89 NB shoulder above the Turkey River in a small depressional area with a slight gradient. The hydrology is likely a result of overland sheet flow that is then retained until infiltrated by the soils within the wetland. The vegetation within the wetland was dominated by invasive purple loosestrife, broad leaf cattails, soft rush and other non-dominant hydrophytes. Soils are fine sandy loams, featuring a low chroma depleted matrix.

Assessment of Wetland C Functions and Values

Wetland C is located adjacent to the highway, is isolated and small. Due to these factors, it has reduced functions and values. The small size of the wetland, and isolated nature reduce its function for groundwater recharge, floodflow alteration, nutrient retention and wildlife habitat. The proximity to the highway limits utilization and aesthetics as well. The most significant function of the wetland is that it receives runoff with excess sediments and toxicants from the surrounding highway. It does not contain significant vegetation to properly treat or attenuate excessive nutrients, with the herbaceous stratum providing the only vegetation. The wetland will also be able to store and retain small amounts of the runoff it receives. See the included Function & Value Form for rationale and additional comments.



This is a view of Wetland C along I-89 NB.

Wetland Function-Value Evaluation Form

Wetland I.D. Wetland C
 Latitude _____ Longitude _____
 Prepared by: CB, JS Date 1/14/21
 Wetland Impact: _____
 Type _____ Area _____

Evaluation based on:
 Office Field
 Corps manual wetland delineation completed? Y N

Total area of wetland Unknown Human made? No Is wetland part of a wildlife corridor? No or a "habitat island"? No
 Adjacent land use Highway Distance to nearest roadway or other development ~20
 Dominant wetland systems present PEM1E Contiguous undeveloped buffer zone present No

Is the wetland a separate hydraulic system? Yes If not, where does the wetland lie in the drainage basin? _____
 How many tributaries contribute to the wetland? 0 Wildlife & vegetation diversity/abundance (see attached list)

Function/Value Suitability Y / N Rationale (Reference #)* Principal Function(s)/Value(s) Comments

 Groundwater Recharge/Discharge	N	1, 2, 4, 5		
 Floodflow Alteration	Y	3, 4, 5, 9		
 Fish and Shellfish Habitat	N			Wetland is not associated with a stream system.
 Sediment/Toxicant Retention	N	1, 2, 6, 8		
 Nutrient Removal	N	3, 9		The wetland has little topographic gradient and is a small depressional pocket.
 Production Export	N			No usable products are present in the wetland
 Sediment/Shoreline Stabilization	N	2, 3,		Wetland is not associated with a stream system
 Wildlife Habitat	Y	1	Y	The wetland is small, and isolated. The proximity to I-89 bordering the wetland limits overland access to the wetland by wildlife.
 Recreation	N			The wetland has no public or safe access in the I-89 ROW.
 Educational/Scientific Value	N	2		The wetland has no public or safe access in the I-89 ROW.
 Uniqueness/Heritage	N			The wetland has no public access in the I-89 ROW. No historical structures were seen on the site.
 Visual Quality/Aesthetics	N			The wetland has no primary viewing area, and is located within the I-89 ROW
 ES Endangered Species Habitat	N			No endangered species were observed while on site.
 Other				

Notes:
 The wetland is small and isolated. It is located in close proximity to the I-89 NB On-ramp and does not provide suitable habitat for wildlife, or safe access for human utilization.
* Refer to backup list of numbered considerations.

Invasive Species

During the course of field work conducted on December 4, 2020 SRE identified and located the invasive plant species within the project area. The dominant invasive plant species were purple loosestrife, *Elaeagnus umbellata* (autumn olive), *Celastrus orbiculatus* (oriental bittersweet) and common reed grass. Non-dominant species observed were *Frangula alnus* (glossy buckthorn), *Rosa multiflora* (multi-flora rose), *Euonymus alatus* (burning bush) and *Polygonum cuspidatum* (Japanese knotweed). Purple loosestrife was observed in every wetland on site in varying degrees of dominance. It was most pervasive in Wetland C and the PEM1Ex wetlands of wetland system B. Autumn olive was observed sporadically throughout the upland areas, primarily along the I-89 shoulders. Oriental bittersweet was observed primarily in Wetland A, and the surrounding uplands, mixed in with the other non-dominant species as well. A dense community of common reed grass was observed within Wetland C, which also included a mixture of purple loosestrife. The non-dominant invasives including glossy buckthorn, multi-flora rose, burning bush and knotweed were located in and adjacent to Wetland A. This portion of the site features the highest overall abundance of invasive species. These invasive species areas are located on the included Wetland Delineation, Stream Cross Section and Invasive Plant Species Plan.



This is a view looking into Wetland C at the Phragmites australis.

Stream Cross Section Assessment

Stoney Ridge Environmental LLC (SRE) performed a stream assessment on the tier 1 intermittent stream on February 4, 2021. The Stream Crossing Worksheet Data Form is included in this report.

Two stream cross section assessments were performed for the tier 1 intermittent stream associated with the project area. Cross section 1 was performed at the inlet of the 48 inch CMP in Wetland A. The upstream cross section to assess the reference reach was performed just outside the project area for a natural reference reach. The intermittent stream is channelized, and shows signs of extensive manmade disturbance. The bankfull width at cross section 1 was 8.5 ft. with a flood prone width of 12.6 ft. The bankfull depth was measured as 1.36 ft. The second cross section was completed approximately 700 feet upstream of cross section 1. Stream cross section 2 was located up stream of the excavated channel. The bankfull width at stream cross section 2 was measured as 5.33 ft. with a flood prone width of 11.5 ft. and a max bankfull depth of 0.75 ft. A location for a third stream cross section was reviewed approximately 800 ft. upstream of cross section 1, above Short Street at a more natural setting. At this location the stream channel began to fragment and become diffuse, with multiple drainages entering the system. SRE determined at this location the intermittent stream had transitioned into a wetland drainage, and as such it was not a representative reference reach. Due to this shift in the intermittent stream system, cross section 2 has been used as the reference reach for the assessment.

This is a view looking downstream from the upstream reference reach, Cross Section 2.





WETLANDS PERMIT APPLICATION STREAM CROSSING WORKSHEET

Water Division/Land Resources Management
Wetlands Bureau



RSA/Rule RSA 482-A/ Env-Wt-900

This worksheet can be used to accompany Wetlands Permit Applications when proposing stream crossings.

SECTION 1 - TIER CLASSIFICATIONS	
Determine the contributing watershed size at USGS StreamStats .	
Note: Plans for tier 2 and 3 crossings shall be designed and stamped by a professional engineer who is licensed under RSA 310-A to practice in New Hampshire.	
Size of contributing watershed at the crossing location: 115 acres	
<input checked="" type="checkbox"/> Tier 1: A tier 1 stream crossing is a crossing located on a watercourse where the contributing watershed size is less than or equal to 200 acres.	
<input type="checkbox"/> Tier 2: A tier 2 stream crossing is a crossing located on a watercourse where the contributing watershed size is greater than 200 acres and less than 640 acres.	
<input type="checkbox"/> Tier 3: A tier 3 stream crossing is a crossing that meets any of the following criteria: <ul style="list-style-type: none"> <input type="checkbox"/> On a watercourse where the contributing watershed is more than 640 acres. <input type="checkbox"/> Within a designated river corridor unless: <ul style="list-style-type: none"> a. The crossing would be a tier 1 stream based on contributing watershed size, or b. The structure does not create a direct surface water connection to the designated river as depicted on the national hydrography dataset as found on GRANIT. <input type="checkbox"/> Within a 100-year floodplain (see Section 2 below). <input type="checkbox"/> In a jurisdictional area having any protected species or habitat (NHB DataCheck). <input type="checkbox"/> In a prime wetland or within a duly-established 100-foot buffer, unless a waiver has been granted pursuant to RSA 482-A:11, IV(b) and Env-Wt 706. Review the Wetlands Permit Planning Tool (WPPT) for town prime wetland and prime wetland buffer maps to determine if your project is within these areas. 	
<input type="checkbox"/> Tier 4: A tier 4 stream crossing is a crossing located on a tidal watercourse.	
SECTION 2 - 100-YEAR FLOODPLAIN	
Use the FEMA Map Service Center to determine if the crossing is located within a 100-year floodplain. Please answer the questions below:	
<input checked="" type="checkbox"/> No: The proposed stream crossing <i>is not</i> within the FEMA 100-year floodplain.	
<input type="checkbox"/> Yes: The proposed project <i>is</i> within the FEMA 100-year floodplain. Zone = <input type="text"/> Elevation of the 100-year floodplain at the inlet: <input type="text"/> feet (FEMA EI. or Modeled EI.)	
SECTION 3 - CALCULATING PEAK DISCHARGE	
Existing 100-year peak discharge (Q) calculated in cubic feet per second (CFS): 44.9 CFS	Calculation method: USGS
Estimated bankfull discharge at the crossing location: <input type="text"/> CFS	Calculation method: <input type="text"/>

→ **Note: If tier 1, then skip to Section 10** ←

SECTION 4 - PREDICTED CHANNEL GEOMETRY BASED ON REGIONAL HYDRAULIC CURVES

For tier 2, tier 3 and tier 4 crossings only.

Bankfull Width: <input type="text"/> feet	Mean Bankfull Depth: <input type="text"/> feet
Bankfull Cross Sectional Area: <input type="text"/> square feet (SF)	

SECTION 5 - CROSS SECTIONAL CHANNEL GEOMETRY: MEASUREMENTS OF THE EXISTING STREAM WITHIN A REFERENCE REACH

For tier 2, tier 3 and tier 4 crossings only.

Describe the reference reach location: <input type="text"/>				
Reference reach watershed size: <input type="text"/> acres				

Parameter	Cross Section 1 Describe bed form <small>(e.g. pool, riffle, glide)</small>	Cross Section 2 Describe bed form <small>(e.g. pool, riffle, glide)</small>	Cross Section 3 Describe bed form <small>(e.g. pool, riffle, glide)</small>	Range
Bankfull Width	<input type="text"/> feet	<input type="text"/> feet	<input type="text"/> feet	<input type="text"/> feet
Bankfull Cross Sectional Area	<input type="text"/> SF	<input type="text"/> SF	<input type="text"/> SF	<input type="text"/> SF
Mean Bankfull Depth	<input type="text"/> feet	<input type="text"/> feet	<input type="text"/> feet	<input type="text"/> feet
Width to Depth Ratio	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Max Bankfull Depth	<input type="text"/> feet	<input type="text"/> feet	<input type="text"/> feet	<input type="text"/> feet
Flood Prone Width	<input type="text"/> feet	<input type="text"/> feet	<input type="text"/> feet	<input type="text"/> feet
Entrenchment Ratio	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Use **Figure 1** below to determine the measurements of the Reference Reach Attributes

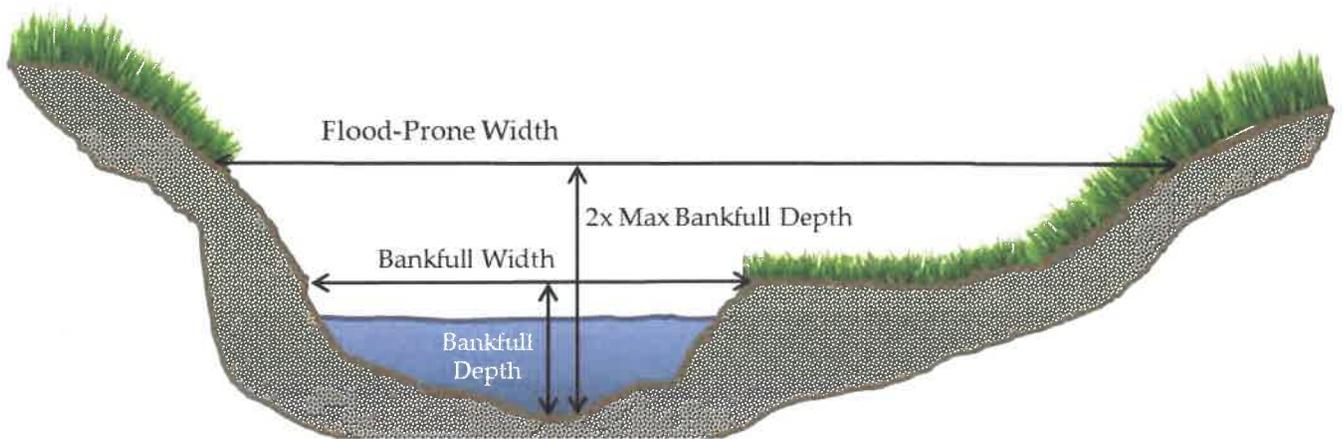


Figure 1: Determining the Reference Reach Attributes.

SECTION 6 - LONGITUDINAL PARAMETERS OF THE REFERENCE REACH AND CROSSING LOCATION

For tier 2, tier 3 and tier 4 crossings only.

Average Channel Slope of the Reference Reach: <input type="text"/>
Average Channel Slope at the Crossing Location: <input type="text"/>

SECTION 7 - PLAN VIEW GEOMETRY

Note: Sinuosity is measured a distance of at least 20 times bankfull width, or 2 meander belt widths.

For tier 2, tier 3 and tier 4 crossings only.

Sinuosity of the Reference Reach: <input type="text"/>
Sinuosity of the Crossing Location: <input type="text"/>

SECTION 8 - SUBSTRATE CLASSIFICATION BASED ON FIELD OBSERVATIONS

For tier 2, tier 3 and tier 4 crossings only.

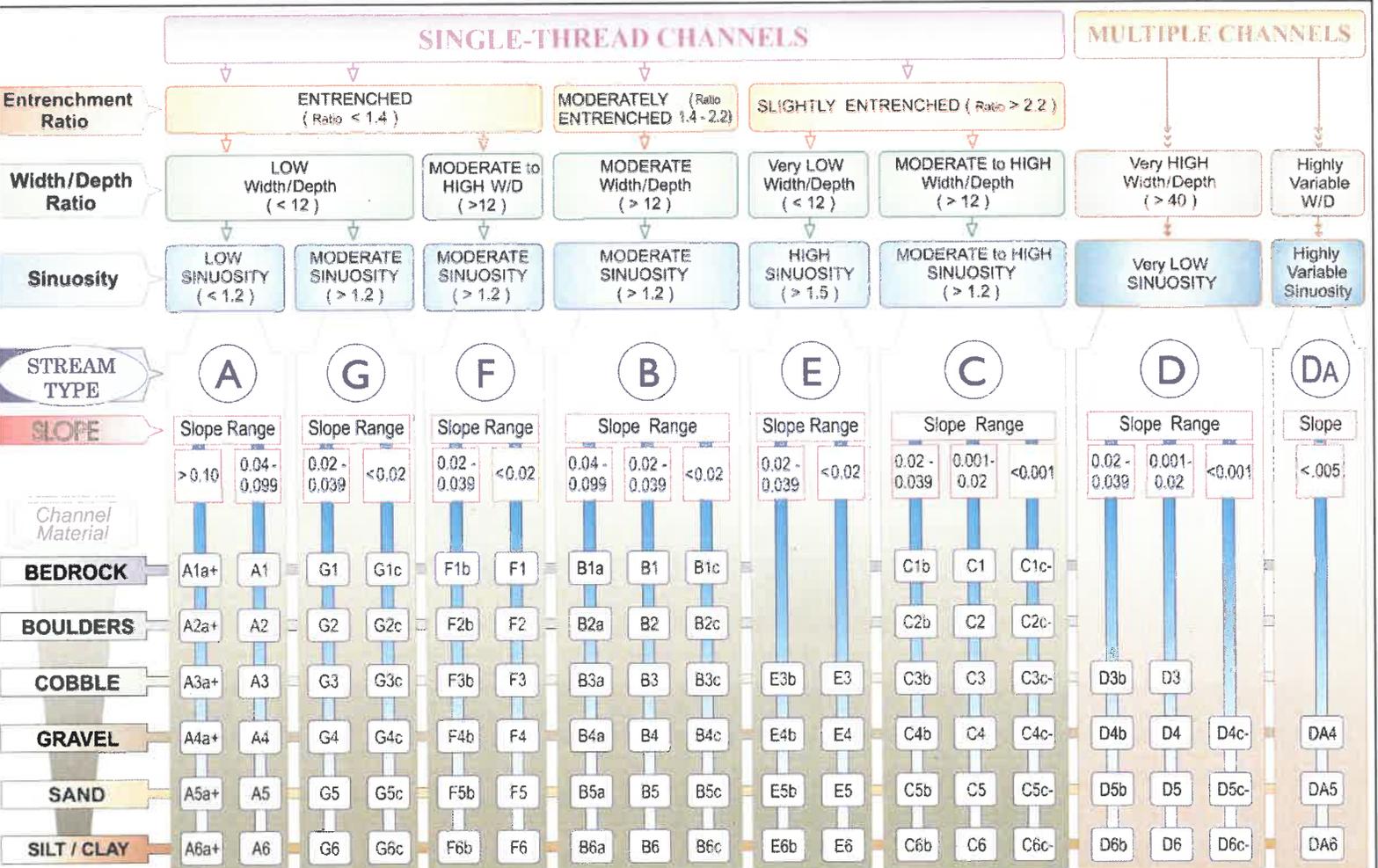
% of reach that is bedrock:	█ %
% of reach that is boulder:	█ %
% of reach that is cobble:	█ %
% of reach that is gravel:	█ %
% of reach that is sand:	█ %
% of reach that is silt:	█ %

SECTION 9 - STREAM TYPE OF REFERENCE REACH

For tier 2, tier 3 and tier 4 crossings only.

Stream Type of Reference Reach:	█
---------------------------------	---

Refer to Rosgen Classification Chart (Figure 2) below:



KEY to the **ROSGEN** CLASSIFICATION of NATURAL RIVERS. As a function of the "continuum of physical variables" within stream reaches, values of **Entrenchment** and **Sinuosity** ratios can vary by +/- 0.2 units, while values for **Width / Depth** ratios can vary by +/- 2.0 units.

Figure 2: Reference from Applied River Morphology, Rosgen, 1996.

irm@des.nh.gov or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

www.des.nh.gov

SECTION 10 - CROSSING STRUCTURE METRICS

Existing Conditions	Existing Structure Type: <input type="checkbox"/> Bridge span <input type="checkbox"/> Pipe arch <input type="checkbox"/> Open-bottom culvert <input checked="" type="checkbox"/> Closed-bottom culvert <input type="checkbox"/> Closed-bottom culvert with stream simulation <input type="checkbox"/> Other: _____					
	Existing Crossing Span: <i>(perpendicular to flow)</i>	4 feet	Culvert Diameter: 4 feet Inlet Elevation: El. _____ feet			
	Existing Crossing Length: <i>(parallel to flow)</i>	292 feet	Outlet Elevation: El. _____ feet Culvert Slope: _____			
Proposed Conditions	Proposed Structure Type:		Tier 1	Tier 2	Tier 3	Alternative Design
	Bridge Span		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Pipe Arch		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
	Closed-bottom Culvert		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
	Open-bottom Culvert		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Closed-bottom Culvert with stream simulation		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Proposed Structure Span: <i>(perpendicular to flow)</i>	_____ feet	Culvert Diameter: _____ feet Inlet Elevation: El. _____ feet			
Proposed Structure Length: <i>(parallel to flow)</i>	_____ feet	Outlet Elevation: El. _____ feet Culvert Slope: _____				
Proposed Entrenchment Ratio:* _____ <i>For Tier 2, Tier 3 and Tier 4 Crossings Only. To accommodate the entrenchment ratio, floodplain drainage structures may be utilized.</i>						

* Note: Proposed Entrenchment Ratio must meet the minimum ratio for each stream type listed in **Figure 3**, otherwise the applicant must address the Alternative Design criteria listed in Env-Wt 904.10.

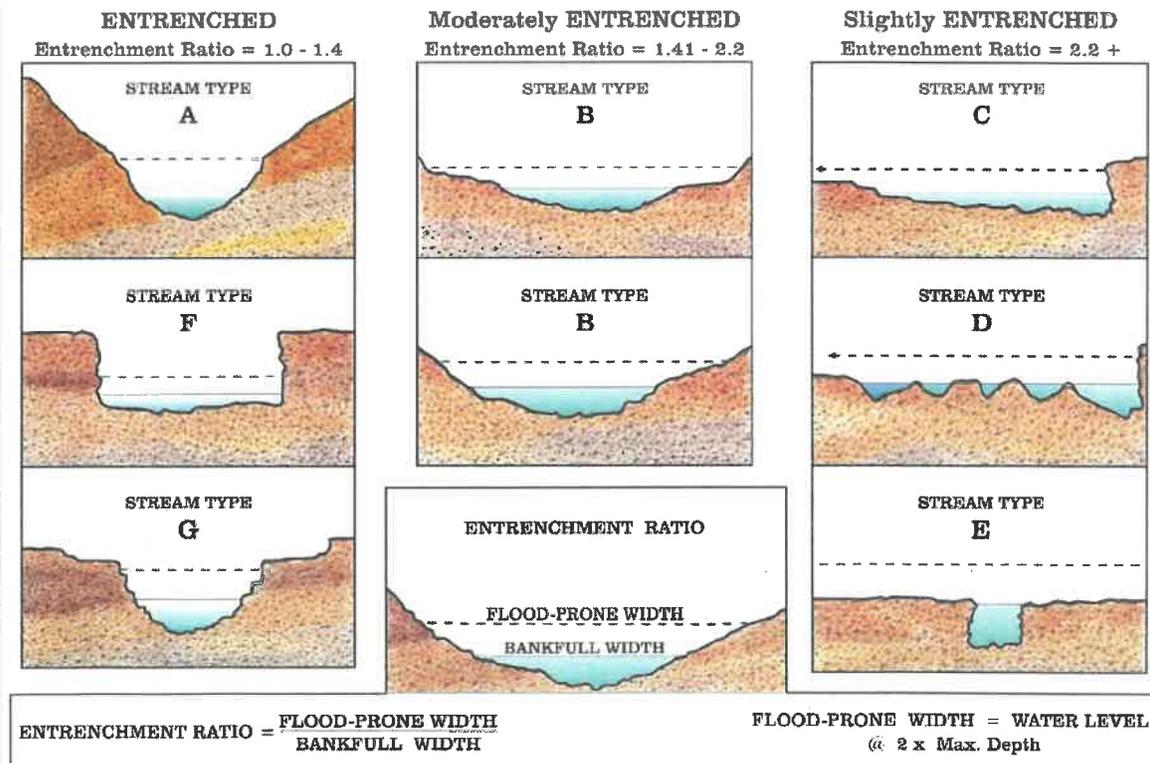


Figure 3: Reference from Applied River Morphology, Rosgen, 1996.

SECTION 11 - CROSSING STRUCTURE HYDRAULICS		
	Existing	Proposed
100 year flood stage elevation at inlet:		
Flow velocity at outlet in feet per second (FPS):		
Calculated 100 year peak discharge (Q) for the <i>proposed</i> structure in CFS:		
Calculated 50 year peak discharge (Q) for the <i>proposed</i> structure in CFS:		

SECTION 12 - CROSSING STRUCTURE OPENNESS RATIO
For tier 2, tier 3 and tier 4 crossings only.

Crossing Structure Openness Ratio* =
 * Openness box culvert = (height x width)/length
 Openness round culvert = (3.14 x radius²)/length

SECTION 13 - GENERAL DESIGN CONSIDERATIONS
 Env-Wt 904.01 requires all stream crossings to be designed and constructed according to the following requirements. Check each box if the project meets these general design considerations.

- All stream crossings shall be designed and constructed so as to:
- Not be a barrier to sediment transport.
 - Prevent the restriction of high flows and maintain existing low flows.
 - Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction.
 - Not cause an increase in the frequency of flooding or overtopping of banks.
 - Maintain or enhance geomorphic compatibility by:
 - a. Minimizing the potential for inlet obstruction by sediment, wood, or debris, and
 - b. Preserving the natural alignment of the stream channel.
 - Preserve watercourse connectivity where it currently exists.
 - Restore watercourse connectivity where:
 - a. Connectivity previously was disrupted as a result of human activity(ies), and
 - b. Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both.
 - Not cause erosion, aggradation, or scouring upstream or downstream of the crossing.
 - Not cause water quality degradation.

SECTION 14 - TIER-SPECIFIC DESIGN CRITERIA
 Stream crossings must be designed in accordance with the tier specific design criteria listed in Part Env-Wt 904.

The proposed project meets the tier specific design criteria listed in Part Env-Wt 904 and each requirement has been addressed in the plans and as part of the wetland application.

SECTION 15 - ALTERNATIVE DESIGN

NOTE: If the proposed crossing does not meet all of the general design considerations, the tier specific design criteria, or the minimum entrenchment ratio for each given stream type listed in **Figure 3**, then an alternative design plan and associated requirements must be addressed pursuant to Env-Wt 904.10.

I have submitted an alternative design and addressed each requirement listed in Env-Wt 904.10.

NH DOT Project# 42704

Region ID: NH
 Workspace ID: NH20201201190412431000
 Clicked Point (Latitude, Longitude): 43.16886, -71.53256
 Time: 2020-12-01 14:04:29 -0500



FOR HTA SRE# 20-092

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.18	square miles

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

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Application Version: 4.4.0

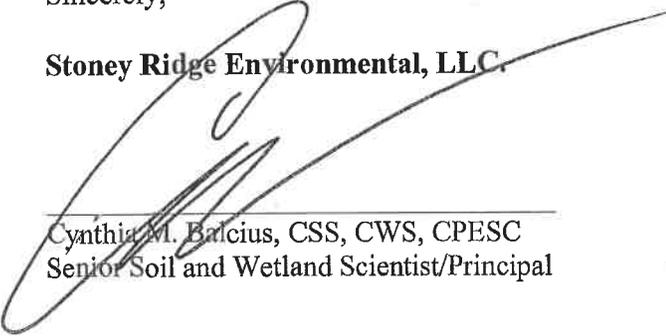
Conclusion

On December 4, 2020 SRE delineated, assessed and surveyed jurisdictional areas and invasive plant species for the NH DOT Project #42704 in Bow, NH on behalf of Hoyle, Tanner & Associates, Inc. SRE delineated the edge of jurisdictional wetlands as well as the ordinary high water mark and top of bank of the Turkey River (where requested as per the project scope) in accordance with the current DES rules. SRE also delineated the extent of invasive plant species observed on site. On February 4, 2021 and at the request of HTA, SRE completed a stream cross section for the unnamed tier 1 stream located within the project area. On January 14, 2021 SRE assessed the functions and values for the wetlands on site, and has attached the forms with this report. All wetland flags were GPS located and imported into AutoCAD for project mapping. SRE created a Wetland Delineation, Stream Cross Section & Invasive Plant Species Plan, with GPS points and polygon shapefiles provided to HTA for finalization.

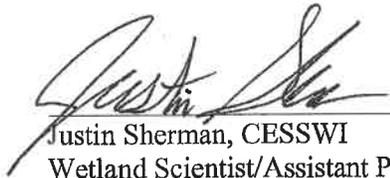
This completes the delineation, stream cross section and invasive plant species report for the project area located at the I-89/I-93 interchange in Bow, New Hampshire. Please feel free to contact our office at 603-776-5825 with any questions.

Sincerely,

Stoney Ridge Environmental, LLC.

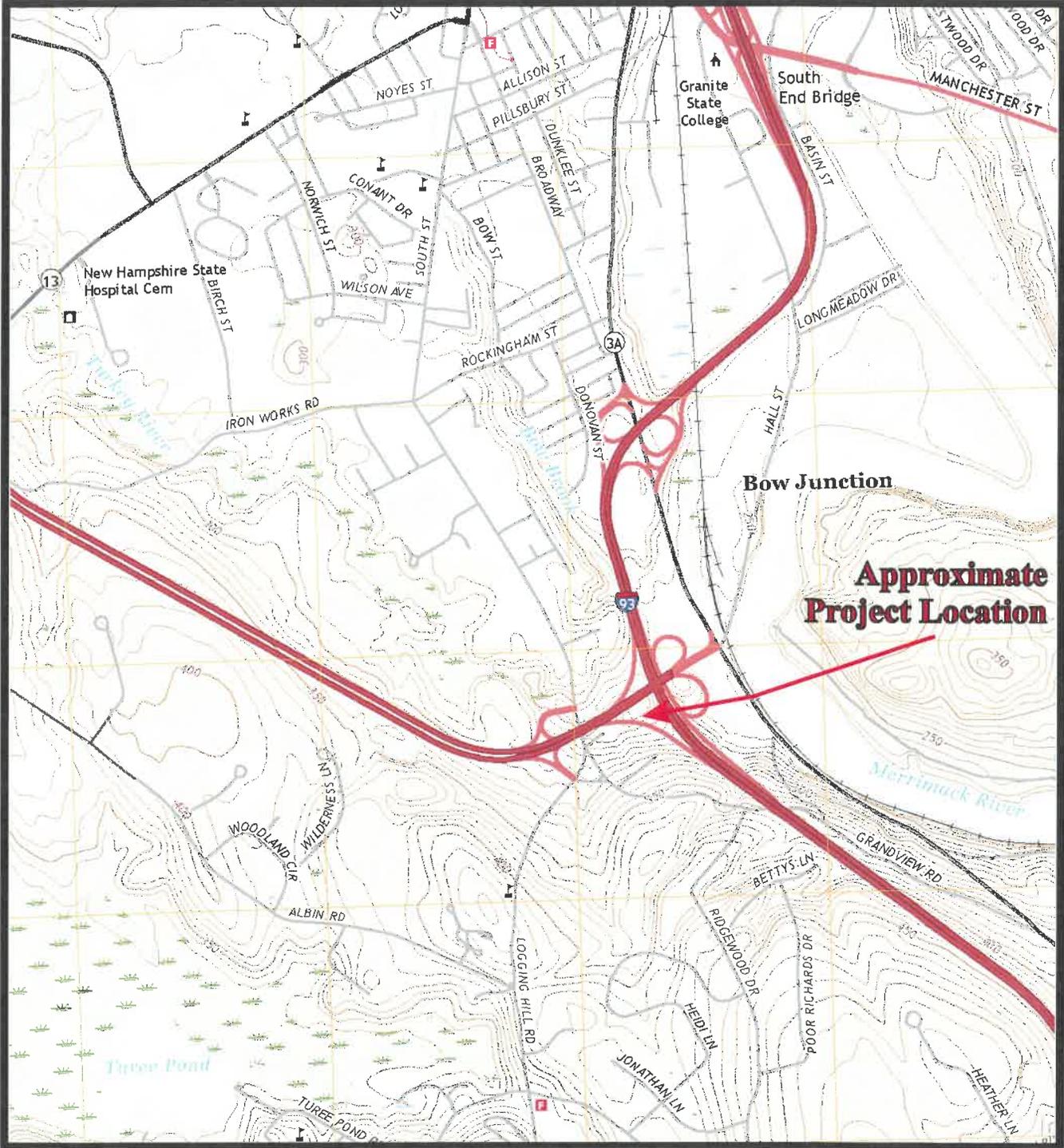


Cynthia M. Balcius, CSS, CWS, CPESC
Senior Soil and Wetland Scientist/Principal



Justin Sherman, CESSWI
Wetland Scientist/Assistant Project Manager

Site Locus
NHDOT Project #42704
I-89/I-93 Interchange
Bow, New Hampshire



Scale 1:24,000



PHOTO LOG

SRE # 20-092

**Hoyle, Tanner & Associates
I-89/I-93 Interchange, NH DOT Project #42704
Bow, New Hampshire
Photos Taken: 12/4/20 and 1/13/21**

PHOTO 1: This is a photo looking south into Wetland A.



PHOTO 2: This is a view of the channelized intermittent stream within wetland A. The stream is bordered by cut stone block.



PHOTO LOG

SRE # 20-092

Hoyle, Tanner & Associates
I-89/I-93 Interchange, NH DOT Project #42704
Bow, New Hampshire
Photos Taken: 12/4/20

PHOTO 3: This is a view of the hydric soil within Wetland A. Soils met a depleted matrix (F3-b) indicator.



PHOTO 4: This is a view looking into the wetland data plot in Wetland A.



PHOTO LOG

SRE # 20-092

**Hoyle, Tanner & Associates
I-89/I-93 Interchange, NH DOT Project #42704
Bow, New Hampshire
Photos Taken: 12/4/20**

PHOTO 5: This is a view of the upland data plot adjacent to Wetland A.



PHOTO 6: This is a view of the recreation trail looking towards Valley Rd. Wetlands B1 are located in the ditches along the trail.



PHOTO LOG

SRE # 20-092

Hoyle, Tanner & Associates
I-89/I-93 Interchange, NH DOT Project #42704
Bow, New Hampshire
Photos Taken: 12/4/20

PHOTO 7: This is a view looking into the PEM1Ex Wetland B2. This wetland was a small pocket receiving water from Wetlands B1, and discharging to B3 via culvert.



PHOTO 8: Purple loosestrife, broad leaf cattail and soft rush are the dominant vegetation in Wetland B2.



PHOTO LOG

SRE # 20-092

**Hoyle, Tanner & Associates
I-89/I-93 Interchange, NH DOT Project #42704
Bow, New Hampshire
Photos Taken: 12/4/20**

PHOTO 9: This is a view overlooking Wetland B3 from the slope of I-93 SB.



PHOTO 10: This is a view looking at the vegetation within the wetland data plot in Wetland B3.



PHOTO LOG

SRE # 20-092

**Hoyle, Tanner & Associates
I-89/I-93 Interchange, NH DOT Project #42704
Bow, New Hampshire
Photos Taken: 12/4/20**

PHOTO 11: The soils within Wetland B3 were saturated with a high percentage of organic matter. Soils met the histosol and hydrogen sulfide indicators.



PHOTO 12: This is a view of the upland data plot adjacent to Wetland B3.



PHOTO LOG

SRE # 20-092

**Hoyle, Tanner & Associates
I-89/I-93 Interchange, NH DOT Project #42704
Bow, New Hampshire
Photos Taken: 12/4/20**

PHOTO 13: This is a view overlooking Wetland C along the on ramp to I-89 NB.



PHOTO 14: This is a view of the soils within Wetland C.



PHOTO LOG

SRE # 20-092

Hoyle, Tanner & Associates
I-89/I-93 Interchange, NH DOT Project #42704
Bow, New Hampshire
Photos Taken: 12/4/20

PHOTO 15: This is a view facing the inlet of the 48" CMP in Wetland A.



PHOTO 16: This is a view facing out from the 48" CMP looking into Wetland A and the intermittent stream.



PHOTO LOG

SRE # 20-092

**Hoyle, Tanner & Associates
I-89/I-93 Interchange, NH DOT Project #42704
Bow, New Hampshire
Photos Taken: 12/4/20**

PHOTO 17: This photo faces the outlet of the 48" CMP at the Turkey River.



PHOTO 18: This is another view facing the culvert from the opposite bank of the Turkey River.

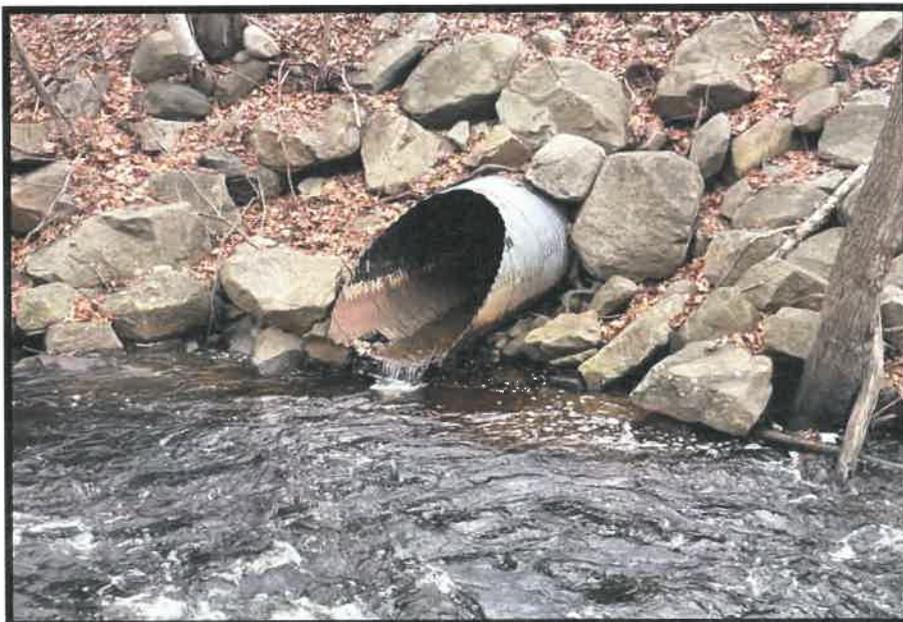


PHOTO LOG

SRE # 20-092

**Hoyle, Tanner & Associates
I-89/I-93 Interchange, NH DOT Project #42704
Bow, New Hampshire
Photos Taken: 12/4/20**

PHOTO 19: This is another view facing the culvert from the opposite bank of the Turkey River.



PHOTO 20: This photo looks down on the outlet from above.



PHOTO LOG

SRE # 20-092

**Hoyle, Tanner & Associates
I-89/I-93 Interchange, NH DOT Project #42704
Bow, New Hampshire
Photos Taken: 12/4/20**

PHOTO 21: This is a view of the inlet of the 18" CMP within Area 2/Wetland B3.



PHOTO 22: This is a view of the outlet of the 18" CMP within the Turkey River. The outlet is submerged in the river, with stones restricting flow.



PHOTO LOG

SRE # 20-092

**Hoyle, Tanner & Associates
I-89/I-93 Interchange, NH DOT Project #42704
Bow, New Hampshire
Photos Taken: 12/4/20**

PHOTO 23: This is another view looking out from the outlet of the 18" CMP from Area 2/Wetland B3 into the Turkey River.



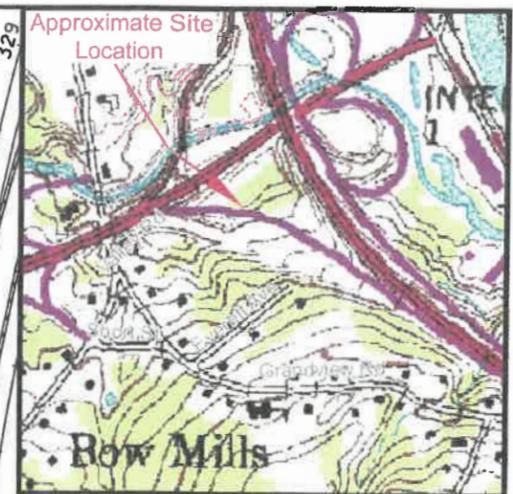
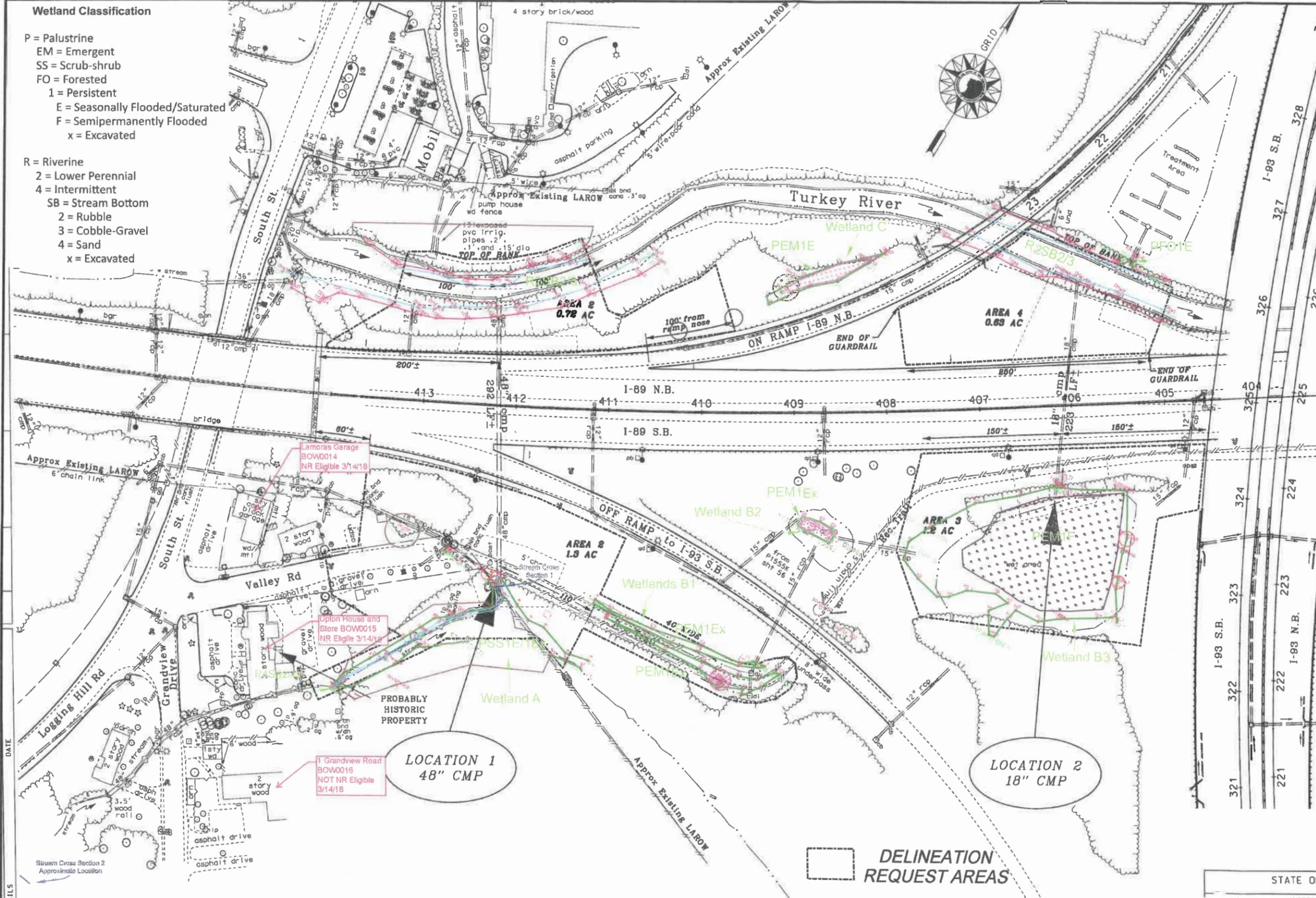
PHOTO 24: This is a view looking down the bank of the Turkey River.



Wetland Classification

P = Palustrine
 EM = Emergent
 SS = Scrub-shrub
 FO = Forested
 1 = Persistent
 E = Seasonally Flooded/Saturated
 F = Semipermanently Flooded
 x = Excavated

R = Riverine
 2 = Lower Perennial
 4 = Intermittent
 SB = Stream Bottom
 2 = Rubble
 3 = Cobble-Gravel
 4 = Sand
 x = Excavated



Legend

- Wetland
- Top of Bank
- Ordinary High Water
- Data Plot Location
- Stream Cross Section
- Mixed Invasives-Autumn Olive, Bittersweet, Buckhorn, Burning Bush, Knotweed, Multiflora Rose
- Autumn Olive
- Oriental Bittersweet
- Oriental Bittersweet & Autumn Olive
- Phragmites australis & Purple Loosestrife
- Purple Loosestrife

- Jurisdictional Wetlands were delineated by Stoney Ridge Environmental L.J.C. on 12.4.2020 utilizing the following standards:
- United States Department of Agriculture, Natural Resources Conservation Service, 2016. *Field Indicators of Hydric Soils in the United States*, Version 6.0. L.M. Vasiles, G.W. Hart, and J.F. Beekunovic (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.
 - Field Indicators for Identifying Hydric Soils in New England*, Version 4, April 2019. New England Hydric Soils Technical Committee.
 - North American Wetland Plants: National Wetland Plant List, version 2.1.0* (<http://www.nwrpl.org/>). U.S. Army Corps of Engineers, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH, and BONAP, Chapeau Hill.
 - The National Wetland Plant List: 2016 wetland ratings*. Lichner, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *Phytotaxonomy* 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X.
 - Corps of Engineers Wetlands Delineation Manual*, January 1987. Wetlands Research Program Technical Report Y-87-1.
 - Regional Supplement to the Corps of Engineers Wetlands Delineation Manual*, Northeast and Northern Region, January 2012, Version 2. U.S. Army Corps of Engineers, Environmental Laboratory ERL-DEL, TR-12-1.
 - Classification of Wetlands and Deepwater Habitats of the United States*, December 1979. L. Cornekin, V. Carter, F. Oloit, and B. LaZoe. US Department of the Interior, Fish and Wildlife Service. FWS/OBS-79/51.
 - Best Management Practices for the Control of Invasive and Noxious Plant Species*, 2018. New Hampshire Department of Transportation.

STATE OF NEW HAMPSHIRE
 DEPARTMENT OF TRANSPORTATION

Wetland Delineation & Survey Completed By
 Stoney Ridge Environmental

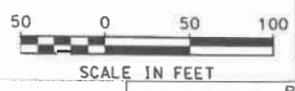
Wetland Delineation, Stream Assessment & Invasive Plant Species Plan

Hoyle, Tanner & Associates, Inc.
 NH DOT Bow
 I-89 & I-93 Interchange
 Bow, NH

Stoney Ridge Environmental L.L.C.
 233 Prospect Mountain Road, Alton, NH
 Phone: 603-776-5825

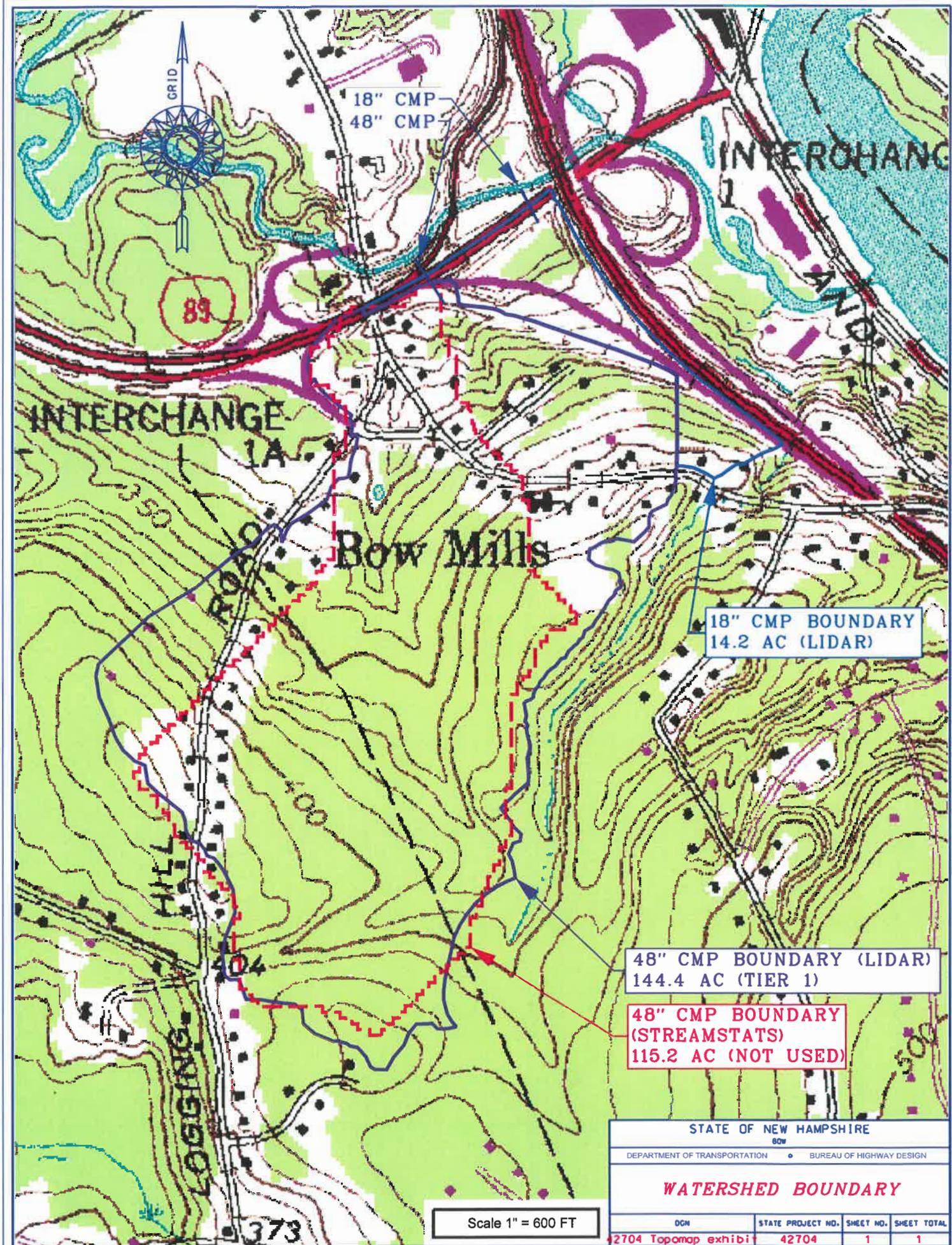
EXISTING DETAIL COPIED FROM 40766 BOW-HOPKINTON, 13742B BOW-CONCORD AND TRACED FROM ARCHIVE PLANS AND AERIAL PHOTOS

LIDAR CONTOURS
 1 FOOT INTERVAL
 NAVD88 DATUM



No.	Date	Description	By
1	1/8/21	Delineation, data plots, invasive	JTS
2	2/9/21	Stream Cross Section	JTS

DATE: 01/8/2021 SCALE: 1:50
 PROJECT NO: 20-092 SHEET 1 of 1



18" CMP
48" CMP

INTERCHANGE 1

89

INTERCHANGE 1A

Bow Mills

18" CMP BOUNDARY
14.2 AC (LIDAR)

48" CMP BOUNDARY (LIDAR)
144.4 AC (TIER 1)

48" CMP BOUNDARY (STREAMSTATS)
115.2 AC (NOT USED)

STATE OF NEW HAMPSHIRE

60W

DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

WATERSHED BOUNDARY

Scale 1" = 600 FT

DGN	STATE PROJECT NO.	SHEET NO.	SHEET TOTAL
2704 Topomap exhibi	42704	1	1

**NH Department of Transportation
Bureau of Highway Design
Bow, 42704**

**Env-Wt 904.08 Repair, Rehabilitation, or Replacement of Tier 1 or Tier 2 Crossings
Stream Crossing Form**

Prepared by: Christopher Carucci, PE

Env-Wt 904.08(a)- The repair, rehabilitation, or replacement of a tier 1 or Tier 2 stream crossing shall be limited to stream crossings where the contributing watershed is as specified for the tier and the certification specified in (b) is provided.

Crossing's Drainage Area: 144.4 acres

Env-Wt 904.08(b)- A project to repair, rehabilitate, or replace a tier 1 or tier 2 crossing shall qualify under this section only if a professional engineer certifies that:

- (1) **The existing crossing does not have a history of causing or contributing to flooding that damages the crossing or other human infrastructure or protected species habitat;**

NHDOT District 5 Maintenance reports no history of flooding associated with this crossing. The crossing can pass the Q50 and Q100 design flows (without bypass).

- (2) **The proposed stream crossing will:**

- a. **Meet the general criteria specified in Env-Wt 904.01;**

see page 2 for Env-Wt 904.01 requirements

- b. **Maintain or enhance the hydraulic capacity of the stream crossing;**

The proposed rehabilitation will not diminish the hydraulic capacity of the crossing. The selected cured-in-place liner has a slightly lower barrel roughness coefficient which will result in a small increase in hydraulic capacity.

- c. **Maintain or enhance the capacity of the crossing to accommodate aquatic organism passage;**

The proposed rehabilitation will not diminish the capacity of the crossing to accommodate aquatic life passage. The existing outlet-mitered end will be shortened to match the bank of the Turkey River and the existing outlet perch will be corrected allowing for improved AOP.

- d. **Maintain or enhance the connectivity of the stream reaches upstream or downstream of the crossing; and**

The existing culvert inlet has no perch and has connectivity. The proposed cured in place liner will have a wall thickness of less than one inch, resulting in no change to connectivity at the inlet.

The culvert outlets in the bank of the Turkey River, but has a significant perch. The perch will be corrected, enhancing connectivity at the outlet.

- e. **Not cause or contribute to the increase in the frequency of flooding or overtopping of the banks upstream or downstream of the crossing.**

The proposed rehabilitation will not adversely affect inlet conditions, or upstream or downstream channels. The outlet velocity will increase slightly, but not enough to adversely affect the heavy riprap on the Turkey River bed and banks. There will be no change to the velocity, flow rate, or flow depth in the Turkey River.

The proposed rehabilitation will not cause an increase in the frequency of flooding or overtopping of banks.

Headwater depth for the Q50 and Q100 design flows will decrease as a result of the proposed rehabilitation. The proposed rehabilitation will have no effect on downstream channels or structures.

Env-Wt 904.08(c)- Rehabilitation of a culvert or other closed-bottom stream crossing structure pursuant to this section may be accomplished by concrete repair, slip lining, cured-in-place lining, or concrete invert lining, or any combination thereof, except that slip lining shall not occur more than once.

The proposed rehabilitation for the 48" cmp is a cured-in-place liner.

Env-Wt 904.01 General Design Considerations Applicable to All Stream Crossings

The crossing meets or exceeds the general design criteria specified in Env-Wt 904.01, as follows:

(a) All stream crossings, whether over tidal or non-tidal waters, shall be designed and constructed so as to:

(1) Not be a barrier to sediment transport;

With the lower roughness coefficient and eliminating any perch at the inlet or outlet, sediment transport will have no barriers and will flow freely with the installation of the cured-in-place liner.

(2) Not restrict high flows and maintain existing low flows;

The proposed rehabilitation will improve the culvert's capacity to pass high flows and will maintain existing low flow. The rehabilitated culvert will pass Q50 and Q100 flows without bypass.

(3) Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction;

The proposed rehabilitation will not diminish the capacity of the crossing to accommodate aquatic life passage. The existing outlet-mitered end will be shortened to match the bank of the Turkey River and the existing perch will be corrected allowing for improved AOP. This design element was coordinated with and supported by NH F&G.

(4) Not cause an increase in the frequency of flooding or overtopping of banks;

The proposed rehabilitation will not increase the frequency of flooding or overtopping of banks. The proposed liner will be less than 1" thick and slightly smoother than the existing cmp resulting in a small increase in capacity and associated small decrease in headwater elevation over a range of flows. There will be no change to the velocity, flow rate, or flow depth in the Turkey River.

(5) Maintain or enhance geomorphic compatibility by:

a. Minimizing the potential for inlet obstruction by sediment, wood, or debris; and

The culvert has a mortared stone inlet headwall that has performed well over the life of the existing culvert. No changes to the inlet geometry are proposed.

b. Preserving the natural alignment of the stream channel;

The proposed rehabilitation will not change the alignment of the culvert in relation to the stream channel. The existing alignment has not caused any problems over the life of the culvert.

(6) Preserve watercourse connectivity where it currently exists;

The proposed rehabilitation will maintain existing connectivity. The proposed liner will not have a significant effect on flow conditions over a range of flows. The stream's connectivity will improve at the outlet because the perched outlet will be eliminated and will tie into the Turkey River's bank.

- (7) Restore watercourse connectivity where:
- a. Connectivity previously was disrupted as a result of human activity(ies); and
 - b. Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both;
The proposed rehabilitation will improve connectivity by eliminating the existing perch at the outlet.
- (8) Not cause erosion, aggradation, or scouring upstream or downstream of the crossing; and
The existing 48" cnp has performed well for about 63 years with no evidence of erosion, aggradation of scouring associated with the crossing. The proposed rehabilitation will not significantly change flow conditions.
- (9) Not cause water quality degradation
There will be no change to drainage area, drainage patterns, or new impervious surfaces. The proposed rehabilitation will have no effect on water quality.
- (b) For stream crossing over tidal waters, the stream crossing shall be designed to:
- (1) Match the velocity, depth, cross-sectional area, and substrate of the natural stream: and
Not applicable
 - (2) Be of sufficient size to not restrict bi-directional tidal flow over the natural tide range above, below, and through the crossing.
Not applicable

CONFIDENTIAL – NH Dept. of Environmental Services review

Memo



NH Natural Heritage Bureau
NHB Datacheck Results Letter

To: Deb Coon, Hoyle, Tanner & Associates, Inc.
150 Dow Street
Manchester, NH 03101

From: Amy Lamb, NH Natural Heritage Bureau

Date: 11/16/2020 (valid for one year from this date)

Re: Review by NH Natural Heritage Bureau

NHB File ID: NHB20-3283

Town: Bow

Location: I89 NB & SB

Description: Culvert Replacement under I89 Northbound & Southbound Travel Lanes

cc: Kim Tuttle

As requested, I have searched our database for records of rare species and exemplary natural communities, with the following results.

Comments: Contact the NH Fish & Game Department to address wildlife concerns.

Vertebrate species

	State ¹	Federal	Notes
Spotted Turtle (<i>Clemmys guttata</i>)	T	--	Contact the NH Fish & Game Dept (see below).
Wood Turtle (<i>Glyptemys insculpta</i>)	SC	--	Contact the NH Fish & Game Dept (see below).

¹Codes: "E" = Endangered, "T" = Threatened, "SC" = Special Concern, "--" = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list. An asterisk (*) indicates that the most recent report for that occurrence was more than 20 years ago.

Contact for all animal reviews: Kim Tuttle, NH F&G, (603) 271-6544.

A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

Dube, Melilotus

From: Sommer, Lori
Sent: Thursday, March 11, 2021 12:23 PM
To: Dube, Melilotus
Cc: Peace, Kimberly R. (kpeace@hoyletanner.com); Large, Sarah; OSullivan, Andrew; Benedict, Karl
Subject: RE: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow (NHDOT # 42704)

Thanks Meli,

I assume you will be noting all of this coordination in the submitted materials and information on the strategy developed? That will complete the record and not require mitigation. Thank you,

Lori

From: Dube, Melilotus
Sent: Thursday, March 11, 2021 10:33 AM
To: Sommer, Lori
Cc: Peace, Kimberly R. (kpeace@hoyletanner.com) ; Large, Sarah ; OSullivan, Andrew
Subject: FW: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow (NHDOT #42704)

Hi Lori,

I am forwarding this to you to keep you in the loop about the coordination that occurred after the February Natural Resource Agency Meeting for the Bow 42704 project. John Magee attended a site visit with several DOT personnel, myself included, and we created a strategy that provides an improvement and is practical from a construction standpoint. The minutes from the meeting indicate that you agree that no mitigation is necessary for this project pending an agreement/resolution of this NHFG issue for turtles, which we have now completed. We will intend to move forward with no planned mitigation for the wetlands permit.

Thanks,
Meli

From: Dube, Melilotus
Sent: Tuesday, March 09, 2021 12:28 PM
To: Large, Sarah <Sarah.E.Large@dot.nh.gov>; Carucci, Christopher <Christopher.A.Carucci@dot.nh.gov>; Magee, John <john.a.magee@wildlife.nh.gov>; 'Peace, Kimberly R.' <kpeace@hoyletanner.com>; '092592.07 - NHDOT Statewide Env #41768 Bow NEPA' <092592.07-NHDOTStatewideEnv#41768BowNEPA@hoyletanner.onmicrosoft.com>; 'Coon, Deb' <dcoon@hoyletanner.com>; OSullivan, Andrew <Andrew.M.OSullivan@dot.nh.gov>
Cc: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>; Metcalf, Jr Paul <Paul.E.MetcalfJr@dot.nh.gov>; Strozewski, Michael <Michael.T.Strozewski@dot.nh.gov>
Subject: RE: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow (NHDOT #42704)

Hello all,

I am writing to follow up on the results of the site visit that was conducted to discuss possibilities for improving AOP, specifically for turtles, at the 48" CMP proposed for rehab as part of the Bow 42704 project. In attendance were Chris Carucci (NHDOT Bureau of Highway Design), John Magee (NHFG), Paul Metcalf (NHDOT Bureau of Construction, DCE), Mike Strozewski (NHDOT Bureau of Construction, CA) and myself. The following points were discussed:

1. Chris provided a detailed description of the proposed work and how cured-in-place liners are applied, and explained that the pipe will retain a slightly corrugated shape and that the liner does not substantially raise the invert of the pipe.
2. The slope leading down to the pipe from the roadway is extremely steep, there was much discussion about the difficulty of getting any heavy machinery down to the outlet without significantly increasing the project impacts, including tree clearing and impacts to the Turkey River bank and channel. It was agreed that any work proposed at the outlet should be minimal to avoid having to construct access roads down to the water.
3. A strategy for improving access to turtles was agreed upon which involves the following:
 - a. Cutting back the pipe to remove the mitered end
 - b. Installing/rearranging boulders at the outlet to mimic the as-built condition of the completely man-made riprapped bank/channel
 - c. Installing smaller stone with partial concrete grouting to hold it in place on top of the boulders to fill in the gaps in the riprap to form a small ramp for turtles leading from the water to the pipe invert. The concrete grouting will be necessary to hold the smaller stone in place during spring flood/high flow conditions.
4. Due to the riprap condition of the manmade channel in the Turkey River in this area, it will not be possible to drive sheets to create an "in the dry" work condition during which to place/cure the concrete for the grouting of the smaller stone. Typical summer conditions in this area are already very low flow, so it was agreed that an "in the dry" condition could be accomplished during the summer with supplemental sandbagging and pumping if necessary.

I trust that this will close the loop on coordination for this issue and will address all concerns for addressing AOP at this location. I will include copies of this correspondence in the NEPA document and wetland application.

Thank you,
Meli

Melilotus M. Dube
Environmental Manager
NHDOT Bureau of Environment
7 Hazen Drive
Concord, NH 03301
(603) 271-1612
NEW EMAIL: Melilotus.M.Dube@dot.nh.gov

From: Large, Sarah <Sarah.E.Large@dot.nh.gov>
Sent: Friday, February 19, 2021 12:40 PM
To: Carucci, Christopher <Christopher.A.Carucci@dot.nh.gov>; Dube, Melilotus <Melilotus.M.Dube@dot.nh.gov>; Magee, John <john.a.magee@wildlife.nh.gov>; 'Peace, Kimberly R.' <kpeace@hoyletanner.com>; '092592.07 - NHDOT Statewide Env #41768 Bow NEPA' <092592.07-NHDOTStatewideEnv#41768BowNEPA@hoyletanner.onmicrosoft.com>; 'Coon, Deb' <dcoon@hoyletanner.com>; OSullivan, Andrew <Andrew.M.OSullivan@dot.nh.gov>
Cc: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>
Subject: RE: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow (NHDOT #42704)

Hi Meli,

Thank you for coordinating this effort. I completely support and agree that including the Environmental Coordinator and CA or DCE would be a great idea. I am interested in participating in the field visit as well. But agree that these design and engineering personnel are key.

Best wishes,

Sarah

From: Carucci, Christopher
Sent: Friday, February 19, 2021 11:16 AM
To: Dube, Melilotus ; Magee, John ; 'Peace, Kimberly R.' ; '092592.07 - NHDOT Statewide Env #41768 Bow NEPA' ; 'Coon, Deb' ; Large, Sarah ; OSullivan, Andrew
Cc: Tuttle, Kim
Subject: RE: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow (NHDOT #42704)

Wouldn't hurt to have the Construction DCE included, but there may be some changes due to upcoming retirements. It is not likely that we will be able to see anything until snow and ice are gone and water level drops. I have attached the only good photo I could find with low water, from 2015. I estimate perch at 18" in this photo which could be corrected by cutting off the end of the pipe a bit and careful placement of a few boulders. Also note that when Turkey River water level is this low, the intermittent stream and the 48" pipe would likely be nearly dry.

From: Dube, Melilotus <Melilotus.M.Dube@dot.nh.gov>
Sent: Friday, February 19, 2021 10:43 AM
To: Magee, John <john.a.magee@wildlife.nh.gov>; 'Peace, Kimberly R.' <kpeace@hoyletanner.com>; '092592.07 - NHDOT Statewide Env #41768 Bow NEPA' <092592.07-NHDOTStatewideEnv#41768BowNEPA@hoyletanner.onmicrosoft.com>; 'Coon, Deb' <dcoon@hoyletanner.com>; Large, Sarah <Sarah.E.Large@dot.nh.gov>; Carucci, Christopher <Christopher.A.Carucci@dot.nh.gov>; OSullivan, Andrew <Andrew.M.OSullivan@dot.nh.gov>
Cc: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>
Subject: RE: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow (NHDOT #42704)

Hi all,

I am reaching out about coordinating a site visit to discuss potential options for improving the outlet 48" pipe into the Turkey River as part of the Bow 42704 project. At this point I am thinking that it would be beneficial to have myself, Chris Carucci or another representative from the Design team, and John Magee. I do not see a need to have Kim Peace or anyone from HTA attend as this is more relevant to the design and permitting process and not essential to the NEPA process, unless of course they want to attend for any reason. I am also including Sarah and Andy in this email in case they think it is appropriate for someone from the Wetlands Program to attend, I will await their response. My only other thought is that it may be useful to have someone from Construction and/or our Environmental Coordinator attend. I know that Construction was highly involved during the meetings that we had for the Warner 15907 fish weir. What do you all think about including construction, and if it seems like a good idea, who would be the most appropriate person? CA if known? DCE?

Thanks,
Meli

From: Dube, Melilotus
Sent: Monday, February 01, 2021 1:03 PM
To: Magee, John <john.a.magee@wildlife.nh.gov>; Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>; 'Peace, Kimberly R.' <kpeace@hoyletanner.com>; '092592.07 - NHDOT Statewide Env #41768 Bow NEPA' <092592.07-NHDOTStatewideEnv#41768BowNEPA@hoyletanner.onmicrosoft.com>; 'Coon, Deb' <dcoon@hoyletanner.com>
Cc: Doperalski, Melissa <Melissa.J.Doperalski@wildlife.nh.gov>
Subject: RE: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow (NHDOT #42704)

Hi John,

At this point I would like to hold off on site visit and instead invite you to attend the February Natural Resource Agency Meeting on the 17th where we will be discussing the project, existing conditions and proposed work. If we need to schedule some additional coordination after that, then I would be happy to address it at that time.

Meli

From: Magee, John

Sent: Friday, January 15, 2021 1:43 PM

To: Dube, Melilotus ; Tuttle, Kim ; 'Peace, Kimberly R.' ; '092592.07 - NHDOT Statewide Env #41768 Bow NEPA' ; 'Coon, Deb'

Cc: Doperalski, Melissa

Subject: Re: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow (NHDOT #42704)

Re: AOP at this one, should we do a site visit to determine what opportunities exist? If so, best time for me is starting around 815 or so.

John Magee (he/him), M.S., Certified Fisheries Professional
Fisheries Habitat Research and Management Programs Coordinator
New Hampshire Fish and Game Department
11 Hazen Drive
Concord, NH 03301
p 603-271-2744
f 603-271-5829

From: Dube, Melilotus

Sent: Wednesday, January 13, 2021 3:04 PM

To: Tuttle, Kim; 'Peace, Kimberly R.'; Magee, John; '092592.07 - NHDOT Statewide Env #41768 Bow NEPA'; 'Coon, Deb'

Cc: Doperalski, Melissa

Subject: RE: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow (NHDOT #42704)

ALL- I APOLOGIZE, I SENT THIS EMAIL ORGINALY WITH THE WRONG PROJECT NUMBER ASSOCIATED WITH THE BOW-HOPKINTON PROJECT. THE PROEJCT # IS BOW-HOPKINTON 40766, THIS IS THE CORRECT VERSION NOW.
MELI

Hi Kim T.,

No, this work is not part of any other project. The 2016 Bow-Hopkinton 40766 project was actually a pavement preservation project that did span a larger area from a roadway perspective, but those projects tend to be very limited in scope due to restrictions associated with the funding sources. There was a time when we tried to incorporate "extra" work into the pavement preservation projects where it was identified, but several years ago we made a shift to keep them strictly preservation and began separating out the more complicated work, such as drainage maintenance, etc, into stand-alone projects with different funding sources. My assumption is that we included the pipe in the scope for Project 40766 initially but it was removed due to funding restrictions. Project 40766 was constructed and completed several years ago now. The current Bow 42704 project is intended to be a maintenance type project and it is beyond the scope of this project to include full roadway reconstruction. I apologize for any confusion, unfortunately it is quite common for DOT to move work from one project to another due to project budgets, timelines, etc.

Please let me know if you have any additional questions.

Meli

From: Tuttle, Kim

Sent: Wednesday, January 13, 2021 2:40 PM

To: 'Peace, Kimberly R.' ; Magee, John ; Dube, Melilotus ; 092592.07 - NHDOT Statewide Env #41768 Bow NEPA ; Coon, Deb

Cc: Doperalski, Melissa

Subject: RE: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow (NHDOT #42704)

Hello Kimberly,

Is this part of the larger I89/I93 reconstruction project? If so, we would like to see project design alternatives that allow for aquatic species passage.

Thanks,

Kim Tuttle

Wildlife Biologist

NH Fish and Game

11 Hazen Drive

Concord, NH 03301

603-271-6544

From: Peace, Kimberly R. <kpeace@hoyletanner.com>

Sent: Wednesday, January 13, 2021 2:21 PM

To: Magee, John <john.a.magee@wildlife.nh.gov>; Dube, Melilotus <Melilotus.M.Dube@dot.nh.gov>; 092592.07 - NHDOT Statewide Env #41768 Bow NEPA <092592.07-NHDOTStatewideEnv#41768BowNEPA@hoyletanner.onmicrosoft.com>; Coon, Deb <dcoon@hoyletanner.com>

Cc: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>

Subject: RE: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow (NHDOT #42704)

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Hi John and Kim, sorry for any confusion, yes the 48" pipe is the same pipe that you reviewed in 2016, however it was removed from the project at that time and was not repaired.

Karl Benedict had also commented on the perched situation at the outlet during a preliminary discussion regarding permitting and advised DOT to reduce the end slightly to allow for a smoother transition into the slope, or build beneath the outlet end with stone to achieve the same. DOT will review the design for revising the outlet in some way to reduce or eliminate the perched situation.

As a reminder, the project includes repair of a second pipe, the 18" wetland pipe to the east, this does not appear to have been reviewed previously, so if you have different comments for that pipe, please let us know.

Thanks-

Kimberly R. Peace

Associate, Senior Environmental Coordinator

Hoyle, Tanner
& Associates, Inc.

150 Dow Street | Manchester, NH 03101

(603) 669-5555, ext 151 | Fax: (603) 669-4168

Cell: (603)716-3343

www.hoyletanner.com

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continue to build a corporate culture that honors and values the individuality and strengths of our team members and our clients.

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From: Magee, John <john.a.magee@wildlife.nh.gov>

Sent: Wednesday, January 13, 2021 1:29 PM

To: Peace, Kimberly R. <kpeace@hoyletanner.com>; Dube, Melilotus <Melilotus.M.Dube@dot.nh.gov>; 092592.07 - NHDOT Statewide Env #41768 Bow NEPA <092592.07-NHDOTStatewideEnv#41768BowNEPA@hoyletanner.onmicrosoft.com>; Coon, Deb <dcoon@hoyletanner.com>

Cc: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>

Subject: RE: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow (NHDOT #42704)

Hello. Kim asked me to take a look at this. In the attached, is the stream in Photo 2 the one that the 48" cmp is on?

Relative to the outlet perch of the 48" cmp, there are some potential opportunities to eliminate it. It may require the removal of some of the outlet end of it and some stone in the outlet channel and maybe a little into the Turkey River (not far into the Turkey River though).

John

John Magee (he/him), M.S., Certified Fisheries Professional
Fisheries Habitat Research and Management Programs Coordinator
New Hampshire Fish and Game Department
11 Hazen Drive
Concord, NH 03301
p 603-271-2744
f 603-271-5829

From: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>

Sent: Wednesday, January 13, 2021 12:39 PM

To: Magee, John <john.a.magee@wildlife.nh.gov>

Subject: FW: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow (NHDOT #42704)

From: Tuttle, Kim

Sent: Wednesday, January 13, 2021 12:35 PM

To: 'Coon, Deb' <dcoon@hoyletanner.com>

Cc: Peace, Kimberly R. <kpeace@hoyletanner.com>; Dube, Melilotus <Melilotus.M.Dube@dot.nh.gov>; 092592.07 - NHDOT Statewide Env #41768 Bow NEPA <092592.07-NHDOTStatewideEnv#41768BowNEPA@hoyletanner.onmicrosoft.com>

Subject: RE: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow (NHDOT #42704)

Deb,

Is this the same job for at least the 48" CMP?

From: Tuttle, Kim <Kim.Tuttle@wildlife.nh.gov>

Sent: Thursday, July 21, 2016 10:51 AM

To: 'Kerry Ryan' <KRyan@dot.state.nh.us>

Cc: Magee, John <john.magee@wildlife.nh.gov>

Subject: RE: Bow-Hopkinton 40766 NHB16-1500

Kerry,

The NHFG Nongame and Endangered Species Program has reviewed NHB16-1500 (note corrected NHB number) for the proposed slip lining of an existing 48" CMP with a 42" plastic liner. The NHB database check identified the following species in the vicinity of the project:

American Eel (*Anguilla rostrata*) SC –

Blanding's Turtle (*Emydoidea blandingii*) E --

Wood Turtle (*Glyptemys insculpta*) SC --

1Codes: "E" = Endangered, "T" = Threatened, "SC" = Special Concern

I spoke to John Magee, NHFG Fisheries Habitat Biologist, and he does not expect fisheries issues as the pipe appears to carry an intermittent stream. We do not expect impacts to Blanding's turtle as significant habitat does not appear to be present in the area of the project. Passage opportunities for wood turtle and other wildlife will be lessened even though the culvert is already impassable for movement upstream because of the significant perch at the outlet. The proposed lining will likely decrease passage opportunities for wood turtles attempting to travel downstream because of the pipe downsizing, smooth slippery interior and increased water velocities through the pipe.

This is another example of a culvert under a major highway slip lined with smooth bore plastic, effectively eliminating all opportunities for wildlife passage, such as the slip lining of Location 10, 36" RCP at MM 30.8 under the FEET in Bow 29024. We'll add this one to the list of these jobs to bring to DOT at some later date for some kind of mitigation consideration. Please feel free to call me if you have any questions about this review.

Sincerely,

Kim Tuttle

Certified Wildlife Biologist

NH Fish and Game

11 Hazen Drive

Concord, NH 03301

From: Kerry Ryan <KRyan@dot.state.nh.us>

Sent: Thursday, July 14, 2016 9:14 AM

To: Tuttle, Kim <Kim.Tuttle@wildlife.nh.gov>

Subject: RE: Bow-Hopkinton 40766 NHB15-1600

Good Morning Kim,

Please find attached photos, aerial map, and photo location map for the proposed slip lining. I have also included two photos from 3-31-16.

This is a 48" cmp pipe. The pipe is 298' long with a slope ~1.18%. At the time of the site visit, 6-17-16, there was a significant perch at the outlet as shown in the photos.

It is a stream crossing. It is an unnamed intermittent stream which outlets into the bank of the Turkey River. The watershed size is 0.18 square miles, according to StramStats.

Design is considering grouting a smaller size culvert (42") inside the larger one. It will most likely be a plastic liner.

Please let me know if you have any more questions or if there is any other information I can provide.

Thank You,

Kerry

From: Tuttle, Kim [<mailto:Kim.Tuttle@wildlife.nh.gov>]

Sent: Thursday, May 26, 2016 8:17 AM

To: Kerry Ryan

Subject: RE: Bow-Hopkinton 40766 NHB15-1600

Kerry,

Could you send more details concerning the proposed slip lining? What materials will be used to slip line the culvert? Is it a stream or wetland crossing? Please send a paragraph describing this aspect of the job including photos at the upstream and downstream ends of the pipe, watershed size, name of the stream, and aerial location.

Thanks,

Kim Tuttle

Certified Wildlife Biologist

NH Fish and Game

11 Hazen Drive

Concord, NH 03301

603-271-6544

From: Kerry Ryan [mailto:KRyan@dot.state.nh.us]

Sent: Wednesday, May 25, 2016 12:19 PM

To: Tuttle, Kim

Subject: Bow-Hopkinton 40766

Hi Kim,

The subject project is a pavement preservation project on Interstate 89 from MM 0.0 to MM 8.2 and will also include work on ramps at exits 1, 2, 3 and 4. Guardrail and guardrail end units will be replaced or repaired as needed. Proposed work will also include pavement reconstruction at Exit 1 where the ramp from I-93 SB merges onto I-89 NB. This area needs full construction with underdrain. It is still unknown if the underdrain will outlet to a nearby catch basin or have its own outlet. Slip lining a nearby 48" cmp is also being proposed. It may be necessary to clear some trees in the area for access purposes.

I have attached topo maps of the project area as well as NHB Report NHB16-1500. Please let me know if you have any concerns with this project or if there is any other information I can provide.

Thank You,

Kerry Ryan

NH Department of Transportation

Bureau of Environment

7 Hazen Drive, Concord, NH 03302

Ph: 603-271-3717

Fax: 603-271-7199

From: Coon, Deb <dcoon@hoyletanner.com>

Sent: Wednesday, January 13, 2021 12:04 PM

To: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>

Cc: Peace, Kimberly R. <kpeace@hoyletanner.com>; Dube, Melilotus <Melilotus.M.Dube@dot.nh.gov>;

092592.07 - NHDOT Statewide Env #41768 Bow NEPA <092592.07-

NHDOTStatewideEnv#41768BowNEPA@hoyletanner.onmicrosoft.com>

Subject: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow (NHDOT #42704)

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Hi Kim

I apologize for the delay in getting back to you regarding this project. I wanted to wait until I had more information and details so I could send you one complete email. As you know the NHDOT is proposing to repair two culverts located under the I-89 NB and SB travel lanes just west of the I-89 crossing under I-93 in Bow. More specific information can be found below.

The western culvert is a 48" CMP that is 292 linear feet and conveys an unnamed Tier 1 stream with a drainage area of 115 acres under a paved recreation trail, the Off Ramp to I-93 SB and both lanes of I-89

before it outlets directly into the Turkey River. The preferred repair alternative for the 48" CMP is a cured in place liner. This is the only rehab method that could come close maintaining existing capacity. This type of liner will conform to the existing corrugations but will be smoother than the original CMP causing some increase in velocity at all flows.

The eastern culvert is an 18" CMP that is 223 linear feet and acts as an equalizer pipe conveying stormwater runoff from a wetland on the south side of I-89 underneath the highway and outlets into the Turkey River. The DOT has advised us that they are unsure of condition throughout the pipe. There is some sediment & debris blockage from the inlet and outlet and are concerned that typical water jet cleaning could cause a failure. They are in the process of contracting with a consultant to do a video inspection. If the pipe is not completely collapsed, the preferred alternative would be to slipline with a 12" steel pipe so that the liner could be forced through minor blockages. The 18" CMP and adjacent upstream wetland/ponded area act like a detention pond, so reduction in pipe diameter is not expected to cause any problems.

I have attached a pdf that has two Google Earth images and the pipe locations sketched on them to give you a better idea of their locations. I have also attached a pdf that has photos of the culverts and the surrounding areas.

You had asked if the DOT had corresponded with NHF&G previously about these 2 pipe culverts. We were advised that they believe these crossings were not previous reviewed under other Bow-Concord projects and so there would most likely not have been any coordination with NHF&G for these culverts.

For protected turtle species, your guidance from previous projects would be used for this project and includes:

1. If wood turtles or spotted turtles are found laying eggs in a work area, please contact Melissa Doperalski at (603) 271-1738 or Josh Megyesy at (603) 271-1125
2. The attached turtle sheet would be distributed to all state workers and contractors working at the project site so that they may become familiar with them.
3. Avoidance of the use of welded plastic or 'biodegradable plastic' netting or thread in erosion control matting. The use of erosion control berm, white Filtrex Degradable Woven Silt Sock, or 'wildlife friendly' options such as woven organic material (e.g. coco or jute matting such as North American Green SC150BN or equivalent) will be required. The contract documents will include a condition that the contractor will have to notify NHF&G of the product(s) they intend to use.

We would include all of the above as plan notes, do you have any other suggestions?

Please let me know if you require any additional information to complete your review of the project and site or if you have any additional questions. Something else that might be of interest to you is we will be presenting this project at the February 17, 2021 Natural Resources Agency Meeting.

Thank you for your time.

Deb Coon

Environmental Coordinator

Hoyle, Tanner & Associates, Inc.

Direct: (603) 460-5154

From: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>

Sent: Tuesday, November 17, 2020 12:32 PM

To: Coon, Deb <dcoon@hoyletanner.com>

Cc: Magee, John <john.a.magee@wildlife.nh.gov>

Subject: NHB20-3283 Culvert Replacement I89 Northbound & Southbound Bow

Hi Deb,

In the meantime, let us know if we have corresponded with DOT previously about these 2 pipe culverts. We will definitely need photos of the inlets and outlets of these two culverts and a description and name of the

stream involved -if it is a stream crossing. A cleaner Google Earth imagine of the location would also be helpful.

Thanks,
Kim Tuttle
Wildlife Biologist
NH Fish and Game
11 Hazen Drive
Concord, NH 03301
603-271-6544

From: Coon, Deb <dcoon@hoyletanner.com>
Sent: Tuesday, November 17, 2020 12:25 PM
To: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>
Cc: 092592.07 - NHDOT Statewide Env #41768 Bow NEPA <092592.07-NHDOTStatewideEnv#41768BowNEPA@hoyletanner.onmicrosoft.com>
Subject: FW: [External] NHB review: NHB20-3283

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Hi Kim

Hoyle, Tanner & Associates, Inc. (Hoyle, Tanner) is working with the New Hampshire Department of Transportation (NHDOT) to address structural deficiencies at two pipe culverts beneath the I-89 NB and SB travel lanes just west of the I-89 crossing under I-93 in Bow. We received the attached NHB Report which lists Spotted turtle and Wood turtle. Currently the project is in the study phase and we are looking at alternatives. Once we have more details about the type and methods of reconstruction/repair to the culverts I will reach back out to you for your guidance on avoidance measures for these species.

Thank you and if you have any questions please feel free to contact me.

Deb Coon

Environmental Coordinator
Hoyle, Tanner & Associates, Inc.
(603) 669-5555, ext 106

From: Lamb, Amy <Amy.E.Lamb@dncr.nh.gov>
Sent: Monday, November 16, 2020 2:57 PM
To: Coon, Deb <dcoon@hoyletanner.com>
Cc: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>
Subject: [External] NHB review: NHB20-3283

Attached, please find the review we have completed. If your review memo includes potential impacts to plants or natural communities please contact me for further information. If your project had potential impacts to wildlife, please contact NH Fish and Game at the phone number listed on the review.

Best,

Amy

Amy Lamb
Ecological Information Specialist
NH Natural Heritage Bureau
DNCR - Forests & Lands
172 Pembroke Rd
Concord, NH 03301
603-271-2834

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United States Department of the Interior



FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
<http://www.fws.gov/newengland>

In Reply Refer To:

March 26, 2021

Consultation Code: 05E1NE00-2021-SLI-0332

Event Code: 05E1NE00-2021-E-06469

Project Name: Culvert Maintenance/Repairs I-89 Northbound and Southbound Travel Lanes,
Bow, NH

Subject: Updated list of threatened and endangered species that may occur in your proposed
project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2) (c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at:

<http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>;

<http://www.towerkill.com>; and

[http://](http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html)

www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office

70 Commercial Street, Suite 300

Concord, NH 03301-5094

(603) 223-2541

Project Summary

Consultation Code: 05E1NE00-2021-SLI-0332

Event Code: 05E1NE00-2021-E-06469

Project Name: Culvert Maintenance/Repairs I-89 Northbound and Southbound Travel Lanes, Bow, NH

Project Type: TRANSPORTATION

Project Description: Culvert Maintenance/Repairs I-89 Northbound and Southbound Travel Lanes, Bow, NH

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@43.16948222163866,-71.53194981010293,14z>



Counties: Merrimack County, New Hampshire

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.



United States Department of the Interior



FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
<http://www.fws.gov/newengland>

In Reply Refer To:

March 26, 2021

Consultation code: 05E1NE00-2021-TA-0332

Event Code: 05E1NE00-2021-E-06472

Project Name: Culvert Maintenance/Repairs I-89 Northbound and Southbound Travel Lanes,
Bow, NH

Subject: Verification letter for the 'Culvert Maintenance/Repairs I-89 Northbound and Southbound Travel Lanes, Bow, NH' project under the January 5, 2016, Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-eared Bat and Activities Excepted from Take Prohibitions.

Dear Deb Coon:

The U.S. Fish and Wildlife Service (Service) received on March 26, 2021 your effects determination for the 'Culvert Maintenance/Repairs I-89 Northbound and Southbound Travel Lanes, Bow, NH' (the Action) using the northern long-eared bat (*Myotis septentrionalis*) key within the Information for Planning and Consultation (IPaC) system. This IPaC key assists users in determining whether a Federal action is consistent with the activities analyzed in the Service's January 5, 2016, Programmatic Biological Opinion (PBO). The PBO addresses activities excepted from "take"^[1] prohibitions applicable to the northern long-eared bat under the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, the Action is consistent with activities analyzed in the PBO. The Action may affect the northern long-eared bat; however, any take that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o). Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the PBO satisfies and concludes your responsibilities for this Action under ESA Section 7(a)(2) with respect to the northern long-eared bat.

Please report to our office any changes to the information about the Action that you submitted in IPaC, the results of any bat surveys conducted in the Action area, and any dead, injured, or sick northern long-eared bats that are found during Action implementation. If the Action is not completed within one year of the date of this letter, you must update and resubmit the information required in the IPaC key.

If the Action may affect other federally listed species besides the northern long-eared bat, a proposed species, and/or designated critical habitat, additional consultation between you and this Service office is required. If the Action may disturb bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act is recommended.

[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA Section 3(19)].

Action Description

You provided to IPaC the following name and description for the subject Action.

1. Name

Culvert Maintenance/Repairs I-89 Northbound and Southbound Travel Lanes, Bow, NH

2. Description

The following description was provided for the project 'Culvert Maintenance/Repairs I-89 Northbound and Southbound Travel Lanes, Bow, NH':

Culvert Maintenance/Repairs I-89 Northbound and Southbound Travel Lanes, Bow, NH -

A wetland report was prepared the project and compared to the habitat where know SWP populations have been found, while there may be some habitat in the deeper forested areas that are adjacent to the work areas, most of the immediate work areas are heavily disturbed, which is not optimal for SWP.

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@43.16948222163866,-71.53194981010293,14z>

**Determination Key Result**

This Federal Action may affect the northern long-eared bat in a manner consistent with the description of activities addressed by the Service's PBO dated January 5, 2016. Any taking that may occur incidental to this Action is not prohibited under the final 4(d) rule at 50 CFR §17.40(o). Therefore, the PBO satisfies your responsibilities for this Action under ESA Section 7(a)(2) relative to the northern long-eared bat.

Determination Key Description: Northern Long-eared Bat 4(d) Rule

This key was last updated in IPaC on May 15, 2017. Keys are subject to periodic revision.

This key is intended for actions that may affect the threatened northern long-eared bat.

The purpose of the key for Federal actions is to assist determinations as to whether proposed actions are consistent with those analyzed in the Service's PBO dated January 5, 2016.

Federal actions that may cause prohibited take of northern long-eared bats, affect ESA-listed species other than the northern long-eared bat, or affect any designated critical habitat, require ESA Section 7(a)(2) consultation in addition to the use of this key. Federal actions that may affect species proposed for listing or critical habitat proposed for designation may require a conference under ESA Section 7(a)(4).

Determination Key Result

This project may affect the threatened Northern long-eared bat; therefore, consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.) is required. However, based on the information you provided, this project may rely on the Service's January 5, 2016, *Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions* to fulfill its Section 7(a)(2) consultation obligation.

Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?
Yes
2. Have you determined that the proposed action will have "no effect" on the northern long-eared bat? (If you are unsure select "No")
No
3. Will your activity purposefully **Take** northern long-eared bats?
No
4. [Semantic] Is the project action area located wholly outside the White-nose Syndrome Zone?
Automatically answered
No
5. Have you contacted the appropriate agency to determine if your project is near a known hibernaculum or maternity roost tree?

Location information for northern long-eared bat hibernacula is generally kept in state Natural Heritage Inventory databases – the availability of this data varies state-by-state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited. A web page with links to state Natural Heritage Inventory databases and other sources of information on the locations of northern long-eared bat roost trees and hibernacula is available at www.fws.gov/midwest/endangered/mammals/nleb/nhisites.html.

Yes

6. Will the action affect a cave or mine where northern long-eared bats are known to hibernate (i.e., hibernaculum) or could it alter the entrance or the environment (physical or other alteration) of a hibernaculum?
No
7. Will the action involve Tree Removal?
Yes

8. Will the action only remove hazardous trees for the protection of human life or property?

No

9. Will the action remove trees within 0.25 miles of a known northern long-eared bat hibernaculum at any time of year?

No

10. Will the action remove a known occupied northern long-eared bat maternity roost tree or any trees within 150 feet of a known occupied maternity roost tree from June 1 through July 31?

No

Project Questionnaire

If the project includes forest conversion, report the appropriate acreages below. Otherwise, type '0' in questions 1-3.

1. Estimated total acres of forest conversion:

.18

2. If known, estimated acres of forest conversion from April 1 to October 31

.18

3. If known, estimated acres of forest conversion from June 1 to July 31

0

If the project includes timber harvest, report the appropriate acreages below. Otherwise, type '0' in questions 4-6.

4. Estimated total acres of timber harvest

0

5. If known, estimated acres of timber harvest from April 1 to October 31

0

6. If known, estimated acres of timber harvest from June 1 to July 31

0

If the project includes prescribed fire, report the appropriate acreages below. Otherwise, type '0' in questions 7-9.

7. Estimated total acres of prescribed fire

0

8. If known, estimated acres of prescribed fire from April 1 to October 31

0

9. If known, estimated acres of prescribed fire from June 1 to July 31

0

If the project includes new wind turbines, report the megawatts of wind capacity below. Otherwise, type '0' in question 10.

10. What is the estimated wind capacity (in megawatts) of the new turbine(s)?

0



**US Army Corps
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New England District

Appendix B

Regional General Permits (GPs) Required Information and Corps Secondary Impacts Checklist

In order for the Corps of Engineers to properly evaluate your application, applicants must submit the following information along with the New Hampshire DES Wetlands Bureau application or permit notification forms. Some projects may require more information. For a more comprehensive checklist, go to www.nae.usace.army.mil/regulatory, “Forms/Publications” and then “Application and Plan Guideline Checklist.” Check with the Corps at (978) 318-8832 for project-specific requirements. For your convenience, this Appendix B is also attached to the State of New Hampshire DES Wetlands Bureau application and Permit by Notification forms.

All Projects:

- Corps application form (ENG Form 4345) as appropriate.
- Photographs of wetland/waterway to be impacted.
- Purpose of the project.
- Legible, reproducible black and white (no color) plans no larger than 11”x17” with bar scale. Provide locus map and plan views of the entire property.
- Typical cross-section views of all wetland and waterway fill areas and wetland replication areas.
- In navigable waters, show mean low water (MLW) and mean high water (MHW) elevations. Show the high tide line (HTL) elevations when fill is involved. In other waters, show ordinary high water (OHW) elevation.
- On each plan, show the following for the project:
 - Vertical datum and the NAVD 1988 equivalent with the vertical units as U.S. feet. Don’t use local datum. In coastal waters this may be mean higher high water (MHHW), mean high water (MHW), mean low water (MLW), mean lower low water (MLLW) or other tidal datum with the vertical units as U.S. feet. MLLW and MHHW are preferred. Provide the correction factor detailing how the vertical datum (e.g., MLLW) was derived using the latest National Tidal Datum Epoch for that area, typically 1983-2001.
 - Horizontal state plane coordinates in U.S. survey feet based on the Traverse Mercator Grid system for the State of New Hampshire (Zone 2800) NAD 83.
 - Show project limits with existing and proposed conditions.
 - Limits of any Federal Navigation Project in the vicinity of the project area and horizontal State Plane Coordinates in U.S. survey feet for the limits of the proposed work closest to the Federal Navigation Project;
 - Volume, type, and source of fill material to be discharged into waters and wetlands, including the area(s) (in square feet or acres) of fill in wetlands, below the ordinary high water in inland waters and below the high tide line in coastal waters.
- Delineation of all waterways and wetlands on the project site,:
- Use Federal delineation methods and include Corps wetland delineation data sheets. See GC 2 and www.nero.noaa.gov/hcd for eelgrass survey guidance.
- GP 3, Moorings, contains eelgrass survey requirements for the placement of moorings.
- For activities involving discharges of dredged or fill material into waters of the U.S., include a statement describing how impacts to waters of the U.S. are to be avoided and minimized, and either a statement describing how impacts to waters of the U.S. are to be compensated for (or a conceptual or detailed mitigation plan) or a statement explaining why compensatory mitigation should not be required for the proposed impacts. Please contact the Corps for guidance.



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New England District

**New Hampshire General Permits (GPs)
Appendix B - Corps Secondary Impacts Checklist
(for inland wetland/waterway fill projects in New Hampshire)**

1. Attach any explanations to this checklist. Lack of information could delay a Corps permit determination.
2. All references to “work” include all work associated with the project construction and operation. Work includes filling, clearing, flooding, draining, excavation, dozing, stumping, etc.
3. See GC 5, regarding single and complete projects.
4. Contact the Corps at (978) 318-8832 with any questions.

1. Impaired Waters	Yes	No
1.1 Will any work occur within 1 mile upstream in the watershed of an impaired water? See http://des.nh.gov/organization/divisions/water/wmb/section401/impaired_waters.htm to determine if there is an impaired water in the vicinity of your work area.*	X	
2. Wetlands	Yes	No
2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200 feet of any proposed work?	X	
2.2 Are there proposed impacts to SAS, special wetlands. Applicants may obtain information from the NH Department of Resources and Economic Development Natural Heritage Bureau (NHB) DataCheck Tool for information about resources located on the property at https://www2.des.state.nh.us/nhb_datacheck/ . The book <u>Natural Community Systems of New Hampshire</u> also contains specific information about the natural communities found in NH.		X
2.3 If wetland crossings are proposed, are they adequately designed to maintain hydrology, sediment transport & wildlife passage?	X	
2.4 Would the project remove part or all of a riparian buffer? (Riparian buffers are lands adjacent to streams where vegetation is strongly influenced by the presence of water. They are often thin lines of vegetation containing native grasses, flowers, shrubs and/or trees that line the stream banks. They are also called vegetated buffer zones.)	X	
2.5 The overall project site is more than 40 acres?		X
2.6 What is the area of the previously filled wetlands?	unknown	
2.7 What is the area of the proposed fill in wetlands?	none	
2.8 What is the % of previously and proposed fill in wetlands to the overall project site?	unknown	
3. Wildlife	Yes	No
3.1 Has the NHB & USFWS determined that there are known occurrences of rare species, exemplary natural communities, Federal and State threatened and endangered species and habitat, in the vicinity of the proposed project? (All projects require an NHB ID number & a USFWS IPAC determination.) NHB DataCheck Tool: https://www2.des.state.nh.us/nhb_datacheck/ USFWS IPAC website: https://ecos.fws.gov/ipac/location/index	X	

3.2 Would work occur in any area identified as either “Highest Ranked Habitat in N.H.” or “Highest Ranked Habitat in Ecological Region”? (These areas are colored magenta and green, respectively, on NH Fish and Game’s map, “2010 Highest Ranked Wildlife Habitat by Ecological Condition.”) Map information can be found at: <ul style="list-style-type: none"> • PDF: www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/highest_ranking_habitat.htm. • Data Mapper: www.granit.unh.edu. • GIS: www.granit.unh.edu/data/downloadfreedata/category/databycategory.html. 		X
3.3 Would the project impact more than 20 acres of an undeveloped land block (upland, wetland/waterway) on the entire project site and/or on an adjoining property(s)?		X
3.4 Does the project propose more than a 10-lot residential subdivision, or a commercial or industrial development?		X
3.5 Are stream crossings designed in accordance with the GC 21?	X	
4. Flooding/Floodplain Values	Yes	No
4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?	X	
4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage?	X	
5. Historic/Archaeological Resources		
For a minimum, minor or major impact project - a copy of the Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) with your DES file number shall be sent to the NH Division of Historical Resources as required on Page 11 GC 8(d) of the GP document**	X	

*Although this checklist utilizes state information, its submittal to the Corps is a Federal requirement.

** If your project is not within Federal jurisdiction, coordination with NH DHR is not required under Federal law.

Supplemental Information:

2.6 & 2.8 - The area of previously filled wetlands could not be determined. The project area has been highly developed under multiple NHDOT projects dating back to at least 1958.

4.1 & 4.2 - No fill in the floodplain is proposed.

Section 106 Programmatic Agreement – Cultural Resources Review Effect Finding

Appendix B Certification – Activities with Minimal Potential to Cause Effects

Date Reviewed: 3/8/2021
(Desktop or Field Review Date)

Project Name: Bow

State Number: 42704

FHWA Number: X-A004(950)

Environmental Contact: Melilotus Dube
Email Address: melilotus.m.dube@dot.nh.gov

DOT Project Manager: Kirk Mudgett

Project Description: The project involves the rehabilitation of two corrugated metal pipe culverts (CMP) located under Interstate 89 NB and SB travel lanes just west of the crossing under Interstate 93 in the Town of Bow. The western culvert is a 292' long 48" diameter CMP that conveys an unnamed Tier 1 stream with a drainage area of 144.4 acres and outlets directly into the Turkey River. The eastern culvert is a 223' long 18" diameter CMP that acts as an equalizer pipe conveying stormwater runoff from a wetland on the south side of I-89 under the highway and outlets into the Turkey River. The eastern culvert is within the ¼ mile buffer of the Merrimack River. The purpose of the project is to prevent further deterioration of the culverts so that they remain fully functional. The need for the project is to protect the safety of the traveling public from the potential of roadway collapse which could result from the failure of the culverts. The proposed method of rehabilitation will be sliplining the 48" CMP using a cured-in-place liner, and sliplining the 18" CMP with a 12" smooth interior pipe liner.

Please select the applicable activity/activities:

Highway and Roadway Improvements	
<input type="checkbox"/>	1. Modernization and general highway maintenance that may require additional highway right-of-way or easement , including: Choose an item. Choose an item.
<input type="checkbox"/>	2. Installation of rumble strips or rumble stripes
<input type="checkbox"/>	3. Installation or replacement of pole-mounted signs
<input type="checkbox"/>	4. Guardrail replacement, provided any extension does not connect to a bridge older than 50 years old (unless it does already), and there is no change in access associated with the extension
Bridge and Culvert Improvements	
<input type="checkbox"/>	5. Culvert replacement (excluding stone box culverts), when the culvert is less than 60" in diameter and excavation for replacement is limited to previously disturbed areas
<input type="checkbox"/>	6. Bridge deck preservation and replacement, as long as no character defining features are impacted
<input checked="" type="checkbox"/>	7. Non-historic bridge and culvert maintenance, renovation, or total replacement, that may require minor additional right-of-way or easement , including: a. replacement or maintenance of non-historic bridges Choose an item.
<input type="checkbox"/>	8. Historic bridge maintenance activities within the limits of existing right-of-way, including: Choose an item. Choose an item.
<input type="checkbox"/>	9. Stream and/or slope stabilization and restoration activities (including removal of debris or sediment obstructing the natural waterway, or any non-invasive action to restore natural conditions)
Bicycle and Pedestrian Improvements	

Section 106 Programmatic Agreement – Cultural Resources Review Effect Finding

Appendix B Certification – Activities with Minimal Potential to Cause Effects

<input type="checkbox"/>	10. Construction of pedestrian walkways, sidewalks, sidewalk tip-downs, small passenger shelters, and alterations to facilities or vehicles in order to make them accessible for elderly and handicapped persons
<input type="checkbox"/>	11. Installation of bicycle racks
<input type="checkbox"/>	12. Recreational trail construction
<input type="checkbox"/>	13. Recreational trail maintenance when done on existing alignment
<input type="checkbox"/>	14. Construction of bicycle lanes and shared use paths and facilities within the existing right-of-way
Railroad Improvements	
<input type="checkbox"/>	15. Modernization, maintenance, and safety improvements of railroad facilities within the existing railroad or highway right-of-way, provided no historic railroad features are impacted , including, but not limited to: Choose an item. Choose an item.
<input type="checkbox"/>	16. In-kind replacement of modern railroad features (i.e. those features that are less than 50 years old)
<input type="checkbox"/>	17. Modernization/modification of railroad/roadway crossings provided that all work is undertaken within the limits of the roadway structure (edge of roadway fill to edge of roadway fill) and no associated character defining features are impacted
Other Improvements	
<input type="checkbox"/>	18. Installation of Intelligent Transportation Systems
<input type="checkbox"/>	19. Acquisition or renewal of scenic, conservation, habitat, or other land preservation easements where no construction will occur
<input type="checkbox"/>	20. Rehabilitation or replacement of existing storm drains.
<input type="checkbox"/>	21. Maintenance of stormwater treatment features and related infrastructure

Please describe how this project is applicable under Appendix B of the Programmatic Agreement.

The project proposes culvert repairs by sliplining a 48" CMP and an 18" CMP located under I89 in Bow, NH to prevent further deterioration of the culverts. The project, as described, meets Appendix B of the Programmatic Agreement, Bridge and Culvert Repairs, Item 7.

Please submit this Certification Form along with the Transportation RPR, including photographs, USGS maps, design plans and as-built plans, if available, for review. Note: The RPR can be waived for in-house projects, please consult Cultural Resources Program Staff.

Coordination Efforts:

Has an RPR been submitted to NHDOT for this project?	Yes	NHDHR R&C # assigned?	<u>12373</u>
Please identify public outreach effort contacts; method of outreach and date:	Due to the minimal nature of the project and the lack of historic nature of the culverts, public outreach included letters sent to various Town of Bow public officials, including the Heritage Commission, on November 4, 2020. To date one response has been received from the Bow Emergency Management Department, however this response was not related to Section 106 resources.		

Finding: (To be filled out by NHDOT Cultural Resources Staff)

<input checked="" type="checkbox"/>	No Potential to Cause Effects	<input type="checkbox"/>	No Historic Properties Affected
This finding serves as the Section 106 Memorandum of Effect. No further coordination is necessary.			

Section 106 Programmatic Agreement – Cultural Resources Review Effect Finding

Appendix B Certification – Activities with Minimal Potential to Cause Effects

<input type="checkbox"/>	This project does <i>not</i> comply with Appendix B. Review will continue under Stipulation VII of the Programmatic Agreement. Please contact NHDOT Cultural Resources Staff to determine next steps.
NHDOT comments:	
<i>Sheila Charles</i>	3/11/2021
_____ NHDOT Cultural Resources Staff	_____ Date

Coordination of the Section 106 process should begin as early as possible in the planning phase of the project (undertaking) so as not to cause a delay.

Project sponsors should not predetermine a Section 106 finding under the assumption a project is limited to the activities listed in Appendix B until this form is signed by the NHDOT Bureau of Environment Cultural Resources Program staff.

Every project shall be coordinated with, and reviewed by the NHDOT-BOE Cultural Resources Program in accordance with the *Programmatic Agreement Among the Federal Highway Administration, the New Hampshire State Historic Preservation Office, the Army Corps of Engineers, New England District, the Advisory Council on Historic Preservation, and the New Hampshire Department of Transportation Regarding the Federal Aid Highway Program in New Hampshire*. In accordance with the Advisory Council’s regulations, we will continue to consult, as appropriate, as this project proceeds.

If any portion of the project is not entirely limited to any one or a combination of the activities specified in Appendix B (with, or without the inclusion of any activities listed in Appendix A), please continue discussions with NHDOT Cultural Resources staff.

This No Potential to Cause Effect or No Historic Properties Affected project determination is your Section 106 finding, as defined in the Programmatic Agreement.

Should project plans change, please inform the NHDOT Cultural Resources staff in accordance with Stipulation VII of the Programmatic Agreement.



By NHDOT Highway Design 5/1/2019

48" cmp inlet area, flow from right to left



By Stoney Ridge Environmental (SRE) 12/4/2020

48" cmp inlet

- Wetland #1 Channel (R4SB2/4x), Impact area A
- Wetland #2/A on left (PSS1E/1Ex), Impact area B
- Wetland #2/A on right (PSS1E/1Ex), Impact area C



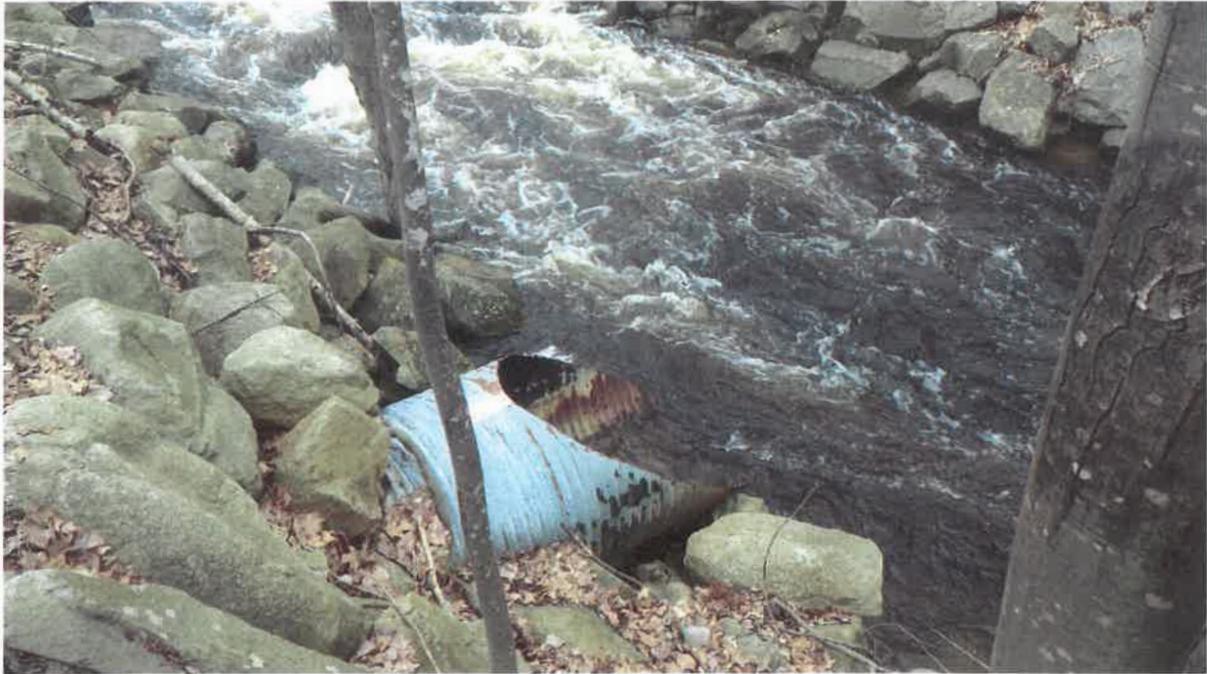
By NHDOT Highway Design 5/1/2019

48" cmp inlet
Showing deteriorated condition



By SRE 12/4/2020

Looking upstream from 48" cmp inlet
Wetland #1 Channel (R4SB2/4x), Impact area A
Wetland #2/A on right (PSS1E/1Ex), Impact area B
Wetland #2/A on left (PSS1E/1Ex), Impact area C



By NHDOT Highway Design 5/1/2019

48" cmp outlet

Wetland #5 Channel (R2SB2/3), Impact Area D Wetland #4 Bank, Impact Area E



By NHDOT Highway Design 3/31/2016

48" cmp outlet, showing perch at low water condition



By NHDOT Highway Design 12/28/2020

18" cmp inlet area (inlet below pink flagging in center), Rec Trail along lower left
Wetland #6/ B3 (PEM1F), Impact Area F



From NHDOT Consultant inspection 9/10/2019

18" cmp inlet
Showing deteriorated condition



From NHDOT Consultant inspection 9/10/2019

18" cmp outlet

Wetland #5 Channel (R2SB2/3), Impact Area G Wetland #4 Bank, Impact Area H



By SRE 12/4/2020

Turkey River looking upstream from 18" cmp outlet

Wetland #5 Channel (R2SB2/3), Impact Area G Wetland #4 Bank, Impact Area H

Additional photos are included in the Wetland Delineation, Stream Assessment, and Invasive Plant Species Report prepared by Stoney Ridge Environmental (SRE), LLC included elsewhere in this application. The referenced report uses a different naming convention for the wetlands (A, B, C ...) vs the NHDOT convention which numbers the wetlands (1, 2, 3 ...) and labels impact areas as A, B, C ... Wetland A delineated and labeled by SRE is referred to as wetland 2 within these photos and on the plans and impact summary table. Wetland B3 delineated and labeled by SRE is referred to as wetland 6 within these photos and on the plans and impact summary table.

CONSTRUCTION SEQUENCE

Sequences shown are for each location separately. Some operations may be performed concurrently when proposed by the Contractor and as approved by the Engineer.

Dewatering basins, water diversion structures, and cofferdams shown on the Erosion Control Plans are approximate. Type, size, and location will be as per Contractor's approved SWPPP.

Location 1 – 48” cnp rehabilitation:

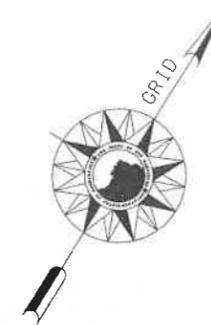
1. Perform any necessary clearing operations for access and staging.
2. Install perimeter sediment controls and install necessary temporary erosion controls as specified on the strategies sheet. Include all staging areas. Set up dewatering basin at outlet.
3. Install cofferdam around outlet.
4. Install water diversion at inlet and other sedimentation controls/BMP's as needed
5. Clean water bypass shall be through the existing pipe, unless otherwise approved as part of the Contractor's SWPPP.
6. Clean and inspect existing pipe.
7. Repair pipe invert as needed, grout any voids around outside of pipe.
8. Install cured in place liner.
9. Trim mitered outlet to match existing riprap bank.
10. Reset stone under and around 48” outlet to eliminate perch. Mortar stones in place.
11. Repair inlet headwall (reset missing stones, re-point mortar joints).
12. Remove water diversion, and re-establish flow through the culvert.
13. Replace chain link fence at inlet in-kind.
14. Stabilize disturbed areas with seed, mulch, and temporary slope matting (where steeper than 4:1). Use wetland seed mix to restore jurisdictional wetland areas.
15. Remove erosion and sediment controls.

Location 2– 18” cnp rehabilitation:

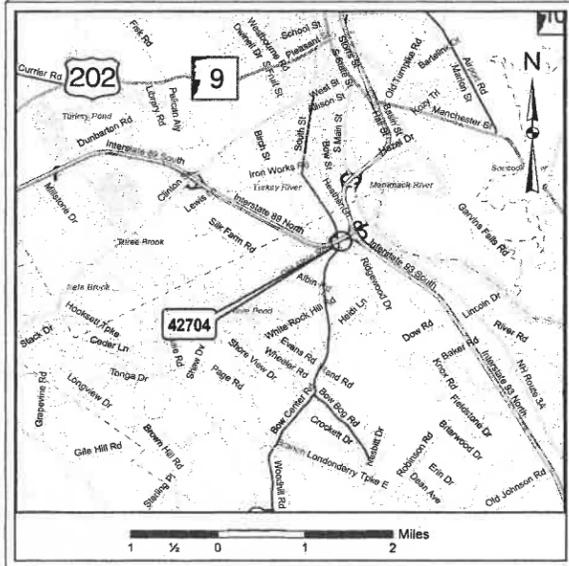
1. Perform any necessary clearing operations for access and staging.
2. Install perimeter sediment controls and install necessary temporary erosion controls as specified on the strategies sheet. Include all staging areas. Set up dewatering basins at inlet and outlet.
3. Install cofferdam at outlet.
4. Install water diversion at inlet and other sedimentation controls/BMP's as needed
5. Clean water bypass shall be through the existing pipe, unless otherwise approved as part of the Contractor's SWPPP.
6. Clean and inspect existing pipe.
7. Install pipe liner. Installation may begin at the inlet or outlet as proposed by the Contractor and approved by the Engineer.
8. Seal annular space between inside of existing culvert and outside of liner.
9. Fill annular space with grout.
10. Remove water diversion, and re-establish flow through the culvert.
11. Stabilize disturbed areas with seed, mulch, and temporary slope matting (where steeper than 4:1). Use wetland seed mix to restore jurisdictional wetland areas.
12. Remove erosion and sediment controls.

**STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION
WETLANDS PLANS
FEDERAL AID PROJECT**

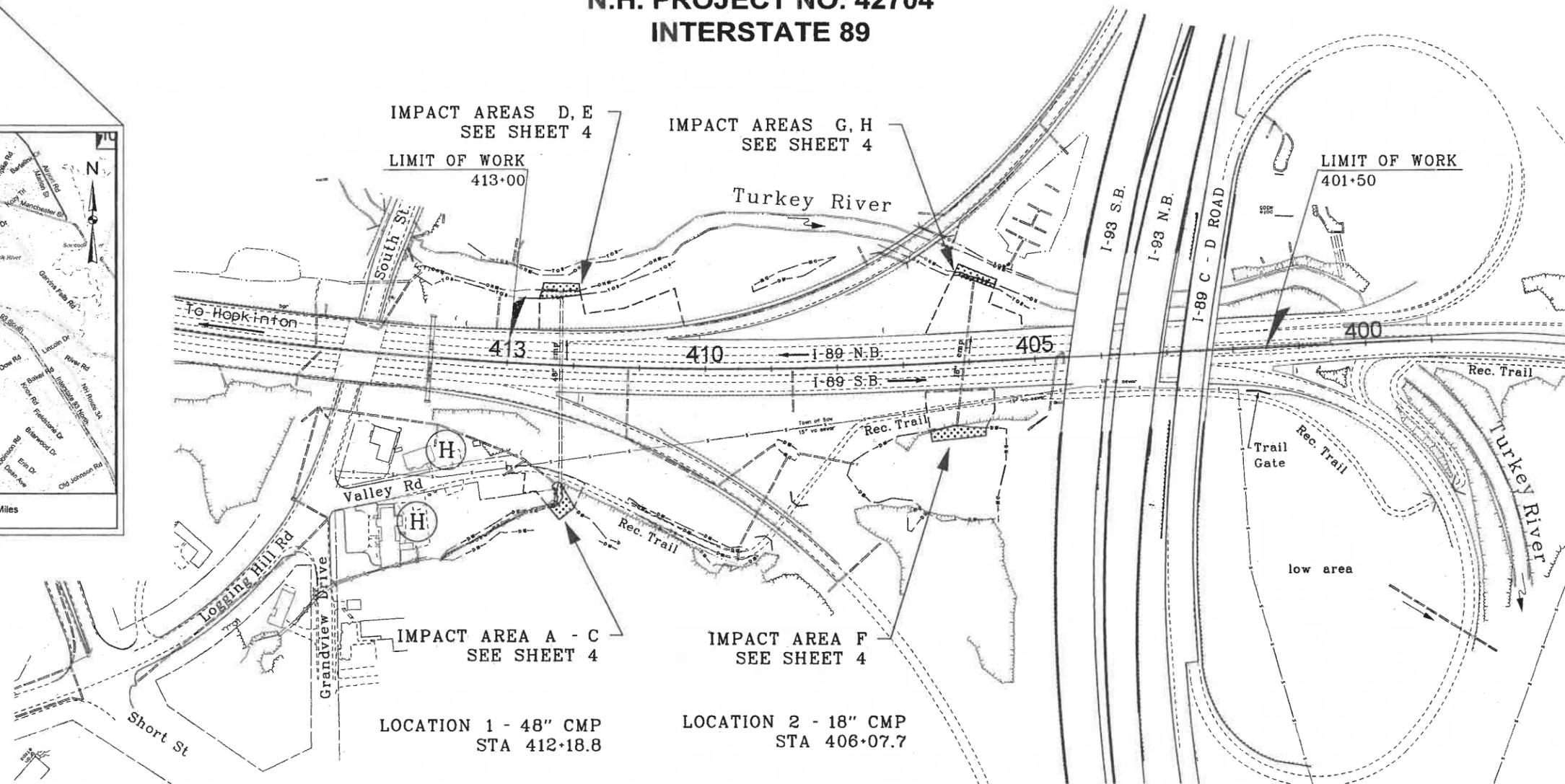
**X-A004(950)
N.H. PROJECT NO. 42704
INTERSTATE 89**



DESIGN DATA	
AVERAGE DAILY TRAFFIC 20 ₁₉	54,049
AVERAGE DAILY TRAFFIC 20 _{XX}	N/A
PERCENT OF TRUCKS	7.2 (2018)
DESIGN SPEED	N/A
LENGTH OF PROJECT	1,150 FT



LOCATION MAP



LOCATION 1 - 48" CMP
STA 412+18.8

LOCATION 2 - 18" CMP
STA 406+07.7

INDEX OF SHEETS

- 1 FRONT SHEET
- 2-3 STANDARD SYMBOLS SHEETS
- 4 WETLAND IMPACT PLAN
- 5,6 WETLAND IMPACT DETAILS
- 7 CULVERT PROFILES & DETAILS
- 8 REC TRAIL ACCESS DETAILS
- 9 EROSION CONTROL STRATEGIES
- 10 EROSION CONTROL PLAN

Per Wetland Plans Rule(s)
Env-Wt 311.05



Wetland Delineation per ENV-Wt 406 by:
Stoney Ridge Environmental, LLC
Justin Sherman and Dianne DeVrise
12/4/2020 and 2/4/2021

Plans Prepared by:
Christopher Carucci, PE

DATE May 7, 2021

**TOWN OF BOW
COUNTY OF MERRIMACK**

SCALE: 1" = 100'

FOR CONSTRUCTION AND ALIGNMENT DETAILS - SEE CONSTRUCTION PLANS

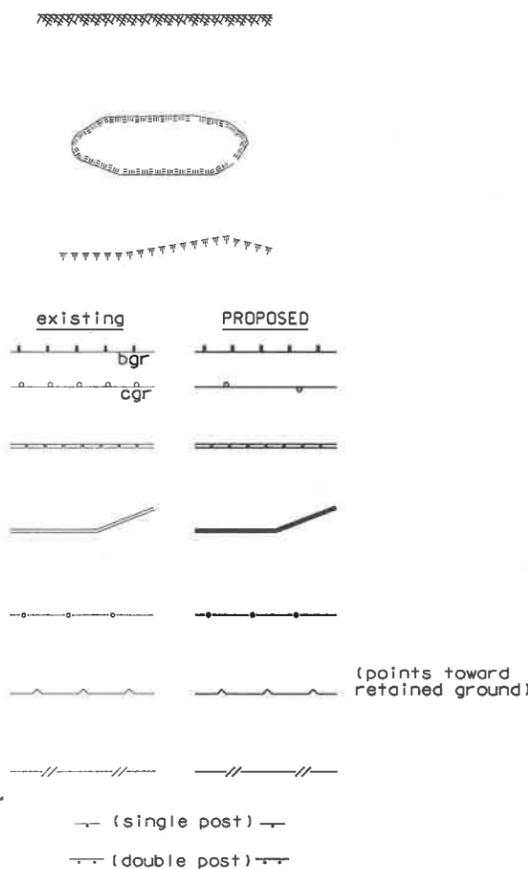
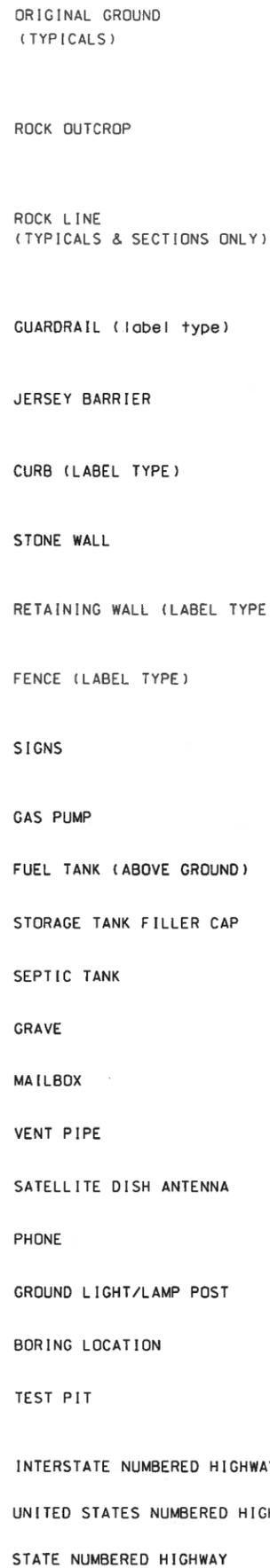
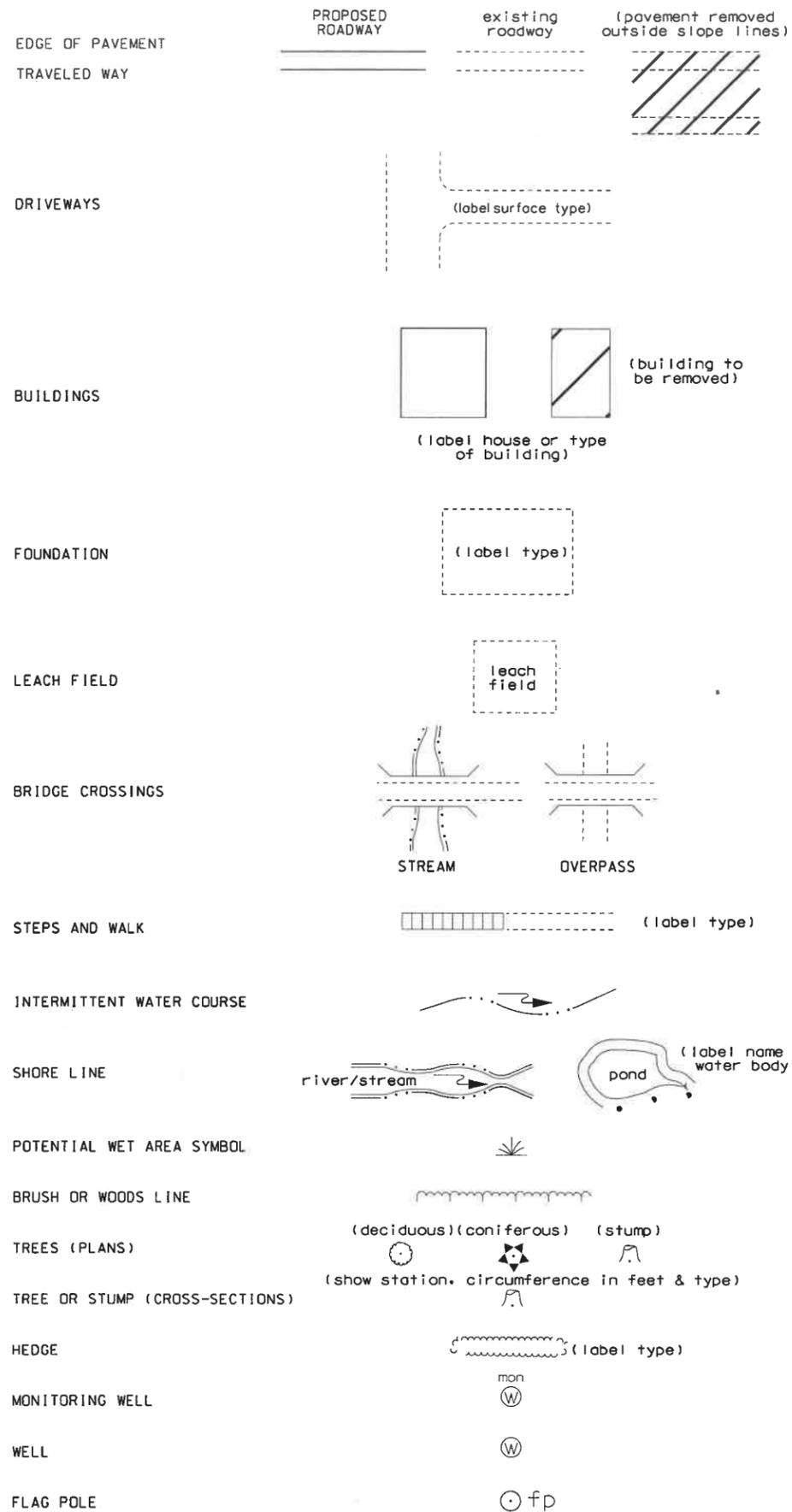


**INTERSTATE 89
Culvert Rehabilitation
Wetland Impact and
Erosion Control Plans**

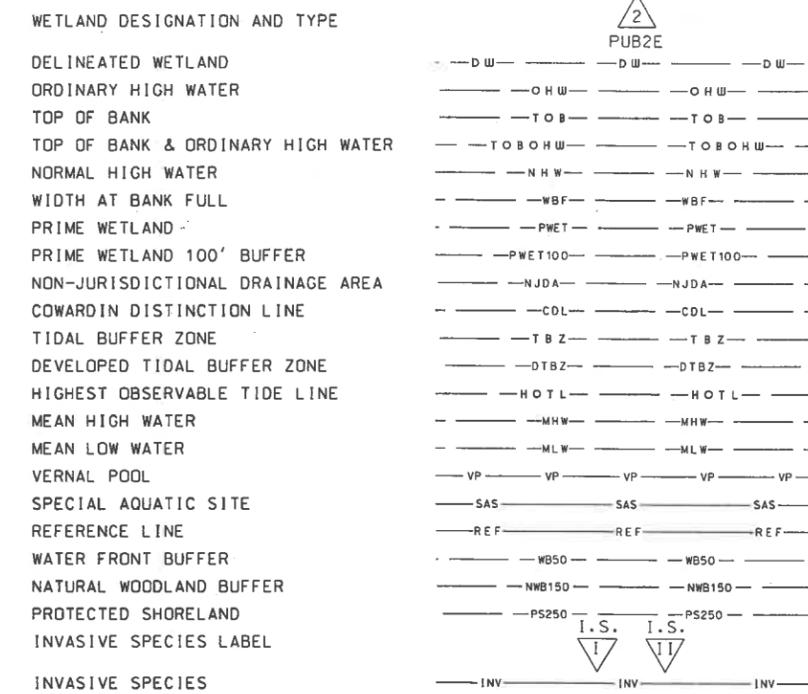
FEDERAL PROJECT NO.	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
X-A004(950)	42704	1	10

DRAWN BY CAC DATE 2/2021
 CHECKED BY J-JN DATE 5/2021

GENERAL



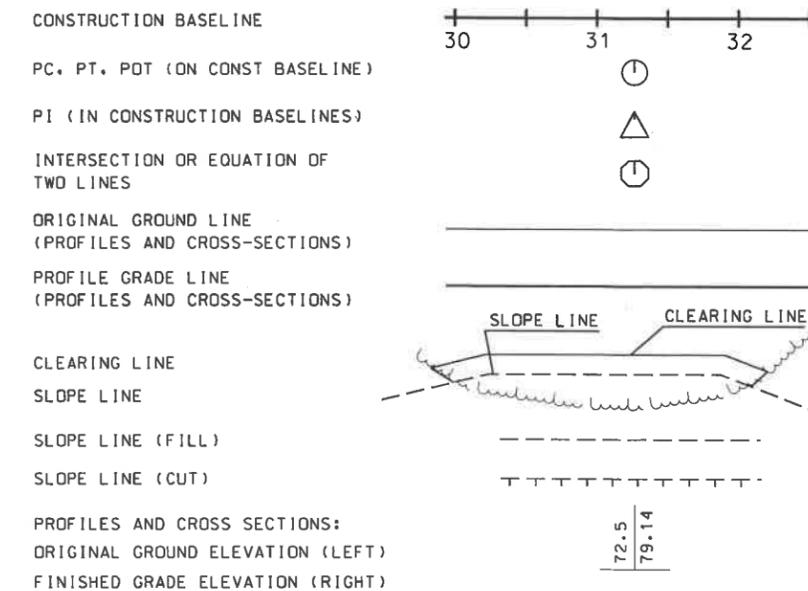
SHORELAND - WETLAND



FLOODPLAIN / FLOODWAY



ENGINEERING



DRAINAGE

MANHOLE		
CATCH BASIN		(existing) (PROPOSED)
DROP INLET		
DRAINAGE PIPE (existing)		(label size & type)
DRAINAGE PIPE (PROPOSED)		
UNDERDRAIN (existing) W/ FLUSHING BASIN		(label size & type)
UNDERDRAIN (PROPOSED) W/ FLUSHING BASIN		
HEADER (existing & PROPOSED)		(with stone outlet protection)
END SECTION (existing & PROPOSED)		METAL or PLASTIC RCP
OPEN DITCH (PROPOSED)		
EROSION CONTROL/ STONE SLOPE PROTECTION		

BOUNDARIES / RIGHT-OF-WAY

RIGHT-OF-WAY LINE		(label type)
RR RIGHT-OF-WAY LINE		
PROPERTY LINE		
PROPERTY LINE (COMMON OWNER)		
TOWN LINE		BOW CONCORD
COUNTY LINE		COOS GRAFTON
STATE LINE		MAINE NEW HAMPSHIRE
NATIONAL FOREST		
CONSERVATION LAND		
BENCH MARK / SURVEY DISK		
BOUND		(PROPOSED)
STATE LINE/ TOWN LINE MONUMENT		S/L T/L
NHDOT PROJECT MARKER		
IRON PIPE OR PIN		
DRILL HOLE IN ROCK		
TAX MAP AND LOT NUMBER		156 14 1642/341 6.80 AC.±
PROPERTY PARCEL NUMBER		12
HISTORIC PROPERTY		

UTILITIES

TELEPHONE POLE		existing	PROPOSED
POWER POLE			
JOINT OCCUPANCY			(plot point at face not center of symbol)
MISCELLANEOUS/UNKNOWN POLE			
GUY POLE OR PUSH BRACE			
LIGHT POLE			
LIGHT ON POWER POLE			
LIGHT ON JOINT POLE			
POLE STATUS: REMOVE, LEAVE, PROPOSED, OR TEMPORARY AS APPLICABLE e.g.:			
RAILROAD		(label ownership)	
RAILROAD SIGN			
RAILROAD SIGNAL			
UTILITY JUNCTION BOX		jb	JB
OVERHEAD WIRE		(label type)	
UNDERGROUND UTILITIES			
WATER (on existing lines label size, type and note if abandoned)		w	PW
SEWER		s	PS
TELEPHONE		T	PT
ELECTRIC		E	PE
GAS		G	PG
LIGHTING		L	PL
INTELLIGENT TRANSPORTATION SYSTEM		ITS	PITS
FIBER OPTIC		FO	PFO
WATER SHUT OFF			
GAS SHUT OFF			
HYDRANT			
MANHOLES			MHS MHT MHE MHG
SEWER			
TELEPHONE			
ELECTRICAL			
GAS			
UNKNOWN			

TRAFFIC SIGNALS / ITS

MAST ARM (existing)		existing	PROPOSED
OPTICOM RECEIVER			
OPTICOM STROBE			
TRAFFIC SIGNAL			
PEDESTAL WITH PEDESTRIAN SIGNAL HEADS AND PUSH BUTTON UNIT			
SIGNAL CONDUIT		-C-C-C-	-PC-PC-PC-
CONTROLLER CABINET		cc	CC
METER PEDESTAL		mp	MP
PULL BDX		pb	PB
LOOP DETECTOR (QUADRUPOLE)			(label size)
LOOP DETECTOR (RECTANGULAR)			(label size)
CAMERA POLE (CCTV)			
FIBER OPTIC DELINEATOR		fod	FOD
FIBER OPTIC SPLICE VAULT			SVF
ITS EQUIPMENT CABINET		its	ITS
VARIABLE SPEED LIMIT SIGN			
DYNAMIC MESSAGE SIGN			
ROAD AND WEATHER INFO SYSTEM			

CONSTRUCTION NOTES

CURB MARK NUMBER - BITUMINOUS	B-1
CURB MARK NUMBER - GRANITE	G-1
CLEARING AND GRUBBING AREA	A
DRAINAGE NOTE	1
EROSION CONTROL NOTE	A
FENCING NOTE	A
GUARDRAIL NOTE	1
ITS NOTE	1
LIGHTING NOTE	A
TRAFFIC SIGNAL NOTE	1

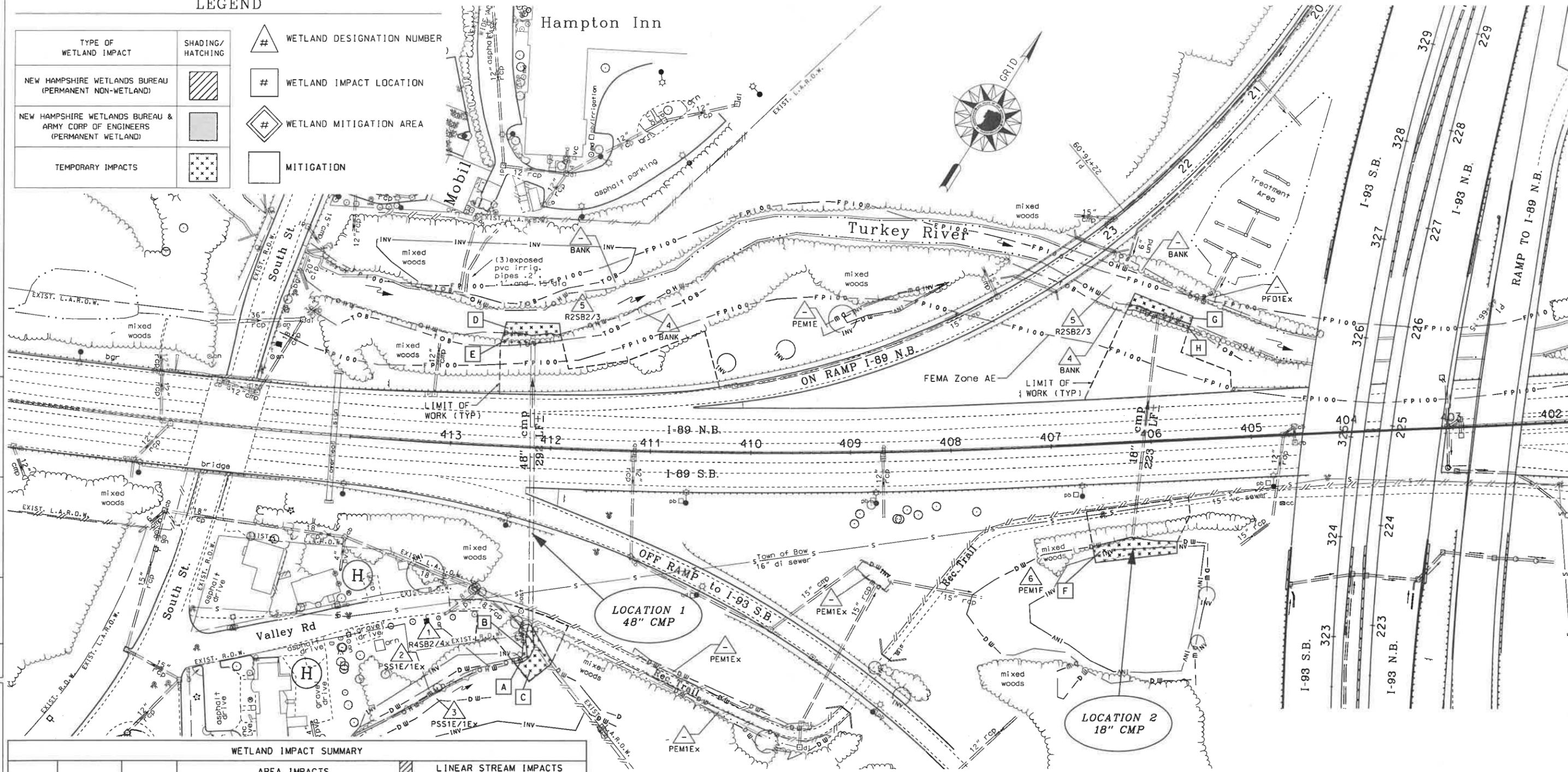
SHEET 2 OF 2

STATE OF NEW HAMPSHIRE				
BOW				
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN				
STANDARD SYMBOLS				
REVISION/DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
9-1-2016	2704 stdsymb1-2	42704	3	10

LEGEND

TYPE OF WETLAND IMPACT	SHADING/HATCHING
NEW HAMPSHIRE WETLANDS BUREAU (PERMANENT NON-WETLAND)	
NEW HAMPSHIRE WETLANDS BUREAU & ARMY CORP OF ENGINEERS (PERMANENT WETLAND)	
TEMPORARY IMPACTS	

- WETLAND DESIGNATION NUMBER
- WETLAND IMPACT LOCATION
- WETLAND MITIGATION AREA
- MITIGATION



WETLAND IMPACT SUMMARY

WETLAND NUMBER	WETLAND CLASSIFICATION	LOCATION	AREA IMPACTS				LINEAR STREAM IMPACTS FOR MITIGATION		
			PERMANENT		TEMPORARY		PERMANENT		
			N.H.W.B. (NON-WETLAND)	N.H.W.B. & A.C.O.E. (WETLAND)	SF	LF	BANK LEFT	BANK RIGHT	CHANNEL
1	R4SB2/4x	A			228	47			
*A 2	PSS1E/1Ex	B			180				
*A 2	PSS1E/1Ex	C			729				
5	R2SB2/3	D			619	56			
4	BANK	E			565	60			
*B3 6	PEM1F	F			1420				
5	R2SB2/3	G			608	63			
4	BANK	H			310	65			
		TOTAL	0	0	4659	291	0	0	0

* Wetland #2 = Wetland A in SRE Wetland Report
 Wetland #6 = Wetland B3 in SRE Wetland Report

PERMANENT IMPACTS: 0 SF
 TEMPORARY IMPACTS: 4659 SF
 TOTAL IMPACTS: 4659 SF

WETLAND CLASSIFICATION CODES

PEM1E/1Ex	PALUSTRINE, EMERGENT, PERSISTENT, SEASONALLY FLOODED/SATURATED / EXCAVATED
PEM1F	PALUSTRINE, EMERGENT, PERSISTENT, SEMI-PERMANENT FLOODED
PSS1E/1Ex	PALUSTRINE, SCRUB-SHRUB, PERSISTENT, SEASONALLY FLOODED/SATURATED / EXCAVATED
R2SB2/3	RIVERINE, LOWER PERENNIAL, STREAM BOTTOM, RUBBLE/COBBLE-GRAVEL
R4SB2/4x	RIVERINE, INTERMITTENT, STREAMBED, RUBBLE/SAND, EXCAVATED
BANK	BANK

LOCATION 1 INLET WORK REQUIRES A TEMPORARY CONSTRUCTION EASEMENT. ALL OTHER WORK IS WITHIN THE EXISTING ROW.

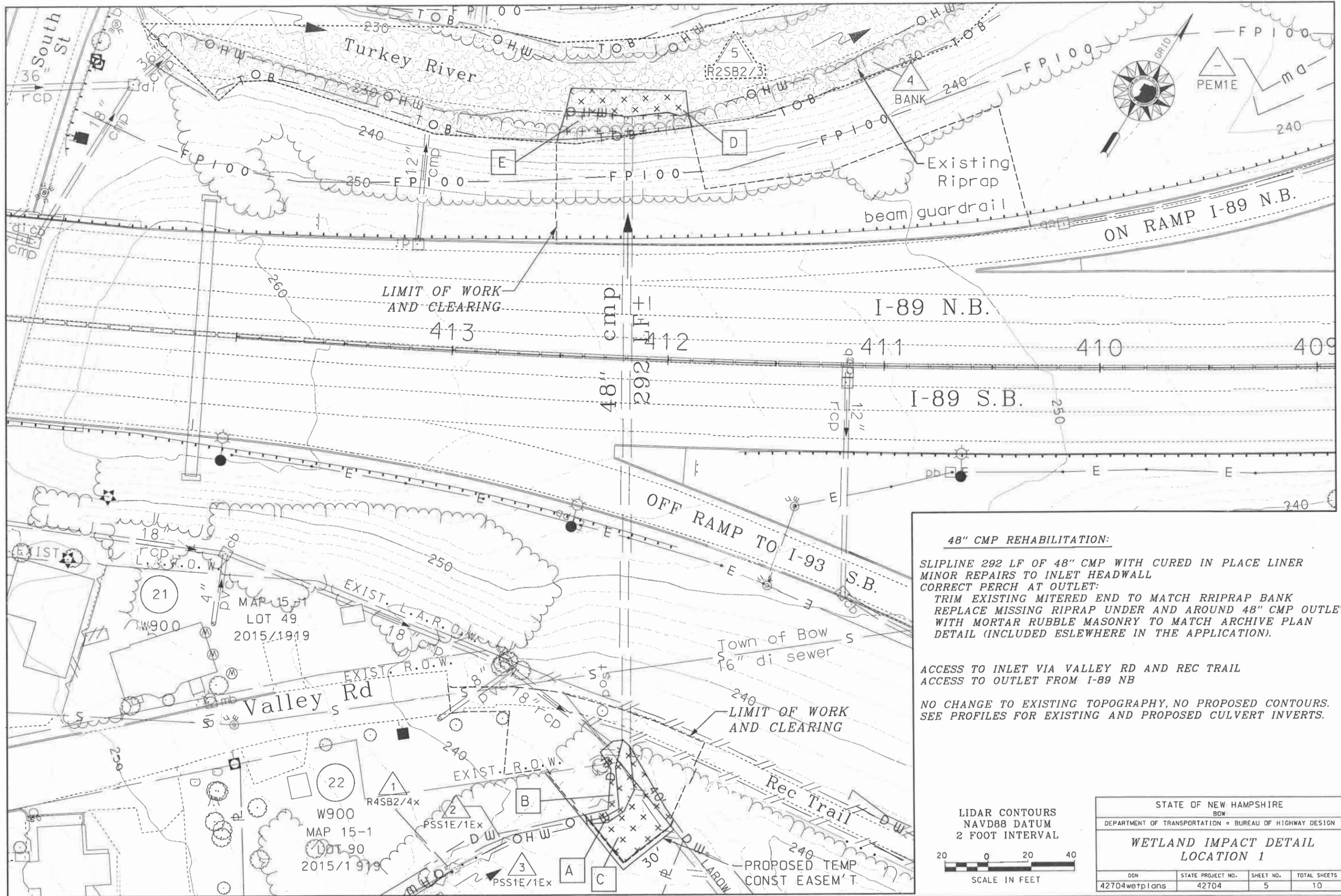
SEE THE FOLLOWING DETAIL SHEETS FOR LARGER VIEWS AND CONTOURS.
 SEE PROFILES FOR CULVERT INVERTS.



STATE OF NEW HAMPSHIRE BOW			
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN			
WETLAND IMPACT PLAN			
DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
42704wetplans	42704	4	10

SDR PROCESSED
 NEW DESIGN CAC
 SHEET CHECKED JUN
 AS BUILT DETAILS
 DATE 3/2021
 DATE 5/2021
 NUMBER
 DATE
 STATION
 STATION
 DESCRIPTION
 REVISIONS AFTER PROPOSAL

SDR PROCESSED	DATE	DATE	DATE	DATE
NEW DESIGN	CAC	3/2021	5/2021	
SHEET CHECKED	JJR			
AS BUILT DETAILS				



48" CMP REHABILITATION:

SLIPLINE 292 LF OF 48" CMP WITH CURED IN PLACE LINER
 MINOR REPAIRS TO INLET HEADWALL
 CORRECT PERCH AT OUTLET:
 TRIM EXISTING MITERED END TO MATCH RRIPRAP BANK
 REPLACE MISSING RIPRAP UNDER AND AROUND 48" CMP OUTLET
 WITH MORTAR RUBBLE MASONRY TO MATCH ARCHIVE PLAN
 DETAIL (INCLUDED ESLEWHERE IN THE APPLICATION).

ACCESS TO INLET VIA VALLEY RD AND REC TRAIL
 ACCESS TO OUTLET FROM I-89 NB

NO CHANGE TO EXISTING TOPOGRAPHY, NO PROPOSED CONTOURS.
 SEE PROFILES FOR EXISTING AND PROPOSED CULVERT INVERTS.

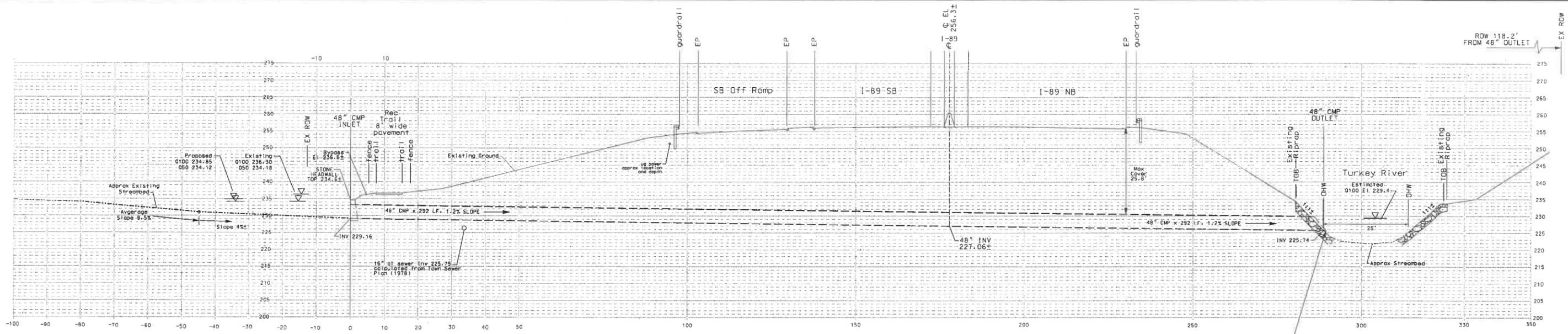
LIDAR CONTOURS
 NAVD88 DATUM
 2 FOOT INTERVAL

SCALE IN FEET

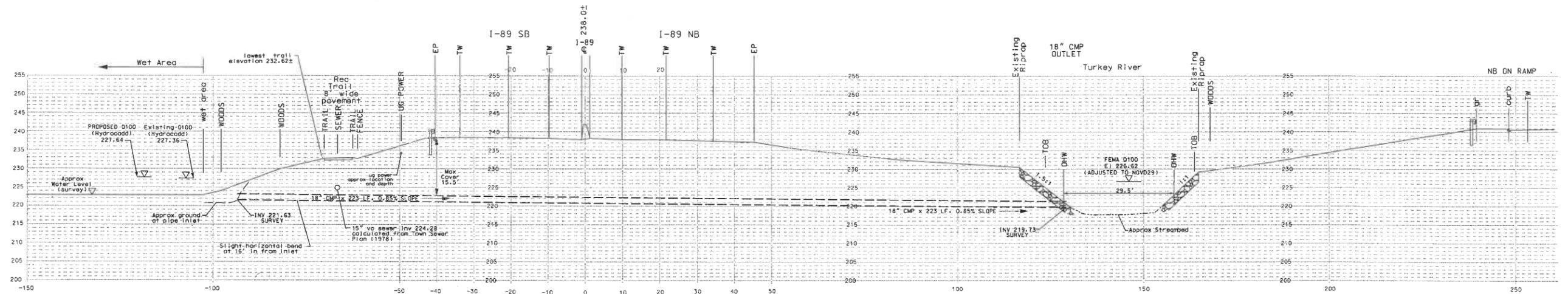
STATE OF NEW HAMPSHIRE			
BOW			
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN			
WETLAND IMPACT DETAIL			
LOCATION 1			
DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
42704wetplans	42704	5	10

SDR PROCESSED	DATE	DATE	DATE	DATE
NEW DESIGN	CAC	3/2021	5/2021	
SHEET CHECKED	JUN			
AS BUILT DETAILS				

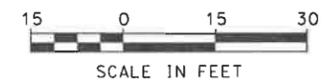
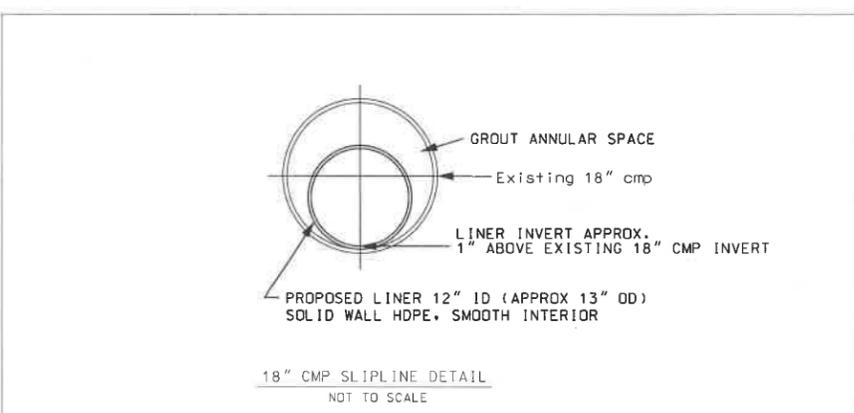
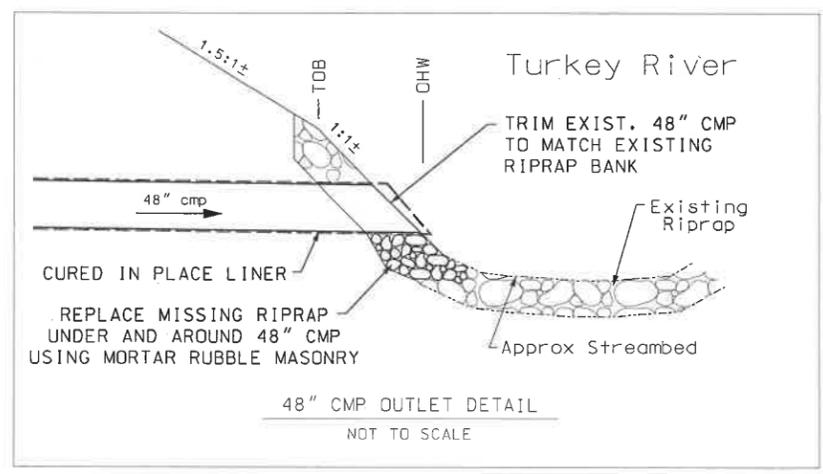
REVISIONS AFTER PROPOSAL	STATION	DESCRIPTION



PROFILE ALONG @ OF EXISTING STREAM AND 48" CMP
ELEVATIONS AND DETAIL FROM NHDOT SURVEY (NGVD29 DATUM) UNLESS OTHERWISE NOTED.



PROFILE ALONG @ OF EXISTING 18" CMP
ELEVATIONS AND DETAIL FROM NHDOT SURVEY (NGVD29 DATUM) UNLESS OTHERWISE NOTED.



STATE OF NEW HAMPSHIRE BOW			
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN			
CULVERT PROFILES & DETAILS			
DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
42704 Profile_pipes	42704	7	10

REVISIONS AFTER PROPOSAL

DESCRIPTION

STATION

STATION

DATE

NUMBER

DATE

DATE

DATE

DATE

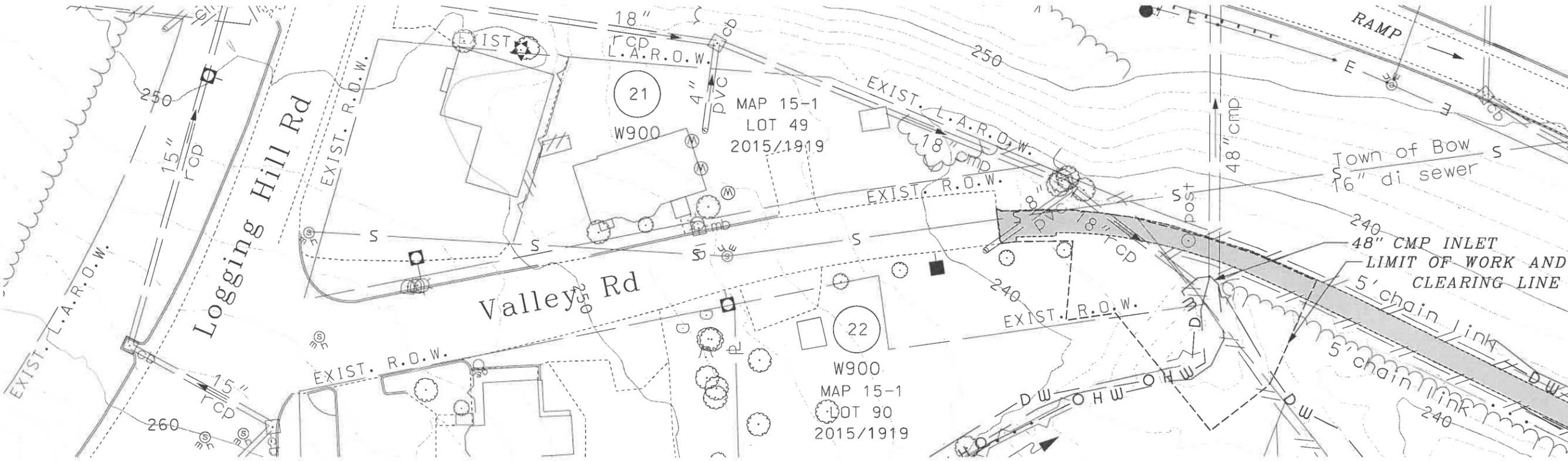
DATE

DATE

DATE



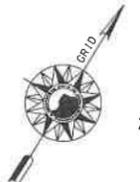
LOCATION 2 - 18" CMP INLET ACCESS



LOCATION 1 - 48" CMP INLET ACCESS

ACCESS NOTES (BOTH LOCATIONS):

ACCESS TO CULVERT INLETS WILL BE VIA REC TRAIL (SHADED).
 TRAIL PAVEMENT IS APPROX. 8' WIDE. DO NOT DISTURB
 GROUND ALONG TRAIL OR ADJACENT INFRASTRUCTURE.
 ANY DAMAGE SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE.
 ACCESS TO OUTLETS WILL BE FROM THE EDGE IF I-89.



LIDAR CONTOURS
 NAVD88 DATUM
 2 FOOT INTERVAL



STATE OF NEW HAMPSHIRE BOW			
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN			
ACCESS DETAILS			
DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
42704 Access_Details	42704	8	10

SDR PROCESSED
 NEW DESIGN CAC
 SHEET CHECKED JUN
 AS BUILT DETAILS

EROSION CONTROL STRATEGIES

1. ENVIRONMENTAL COMMITMENTS:
 - 1.1. THESE GUIDELINES DO NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH ANY CONTRACT PROVISIONS, OR APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS.
 - 1.2. THIS PROJECT WILL BE SUBJECT TO THE US EPA'S NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORM WATER CONSTRUCTION GENERAL PERMIT AS ADMINISTERED BY THE ENVIRONMENTAL PROTECTION AGENCY (EPA). THIS PROJECT IS SUBJECT TO REQUIREMENTS IN THE MOST RECENT CONSTRUCTION GENERAL PERMIT (CGP).
 - 1.3. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE NHDES WETLAND PERMIT, THE US ARMY CORPS OF ENGINEERS PERMIT, WATER QUALITY CERTIFICATION AND THE SPECIAL ATTENTION ITEMS INCLUDED IN THE CONTRACT DOCUMENTS.
 - 1.4. ALL STORM WATER, EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE NEW HAMPSHIRE STORMWATER MANUAL, VOLUME 3, EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION (DECEMBER 2008) (BMP MANUAL) AVAILABLE FROM THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES (NHDES).
 - 1.5. THE CONTRACTOR SHALL COMPLY WITH RSA 485-A:17, AND ALL PUBLISHED NHDES ALTERATION OF TERRAIN ENV-WQ 1500 REQUIREMENTS ([HTTP://DES.NH.GOV/ORGANIZATION/COMMISSIONER/LEGAL/RULES/INDEX.HTM](http://des.nh.gov/organization/commissioner/legal/rules/index.htm))
 - 1.6. THE CONTRACTOR IS DIRECTED TO REVIEW AND COMPLY WITH SECTION 107.1 OF THE CONTRACT AS IT REFERS TO SPILLAGE, AND ALSO WITH REGARDS TO EROSION, POLLUTION, AND TURBIDITY PRECAUTIONS.
 2. STANDARD EROSION CONTROL SEQUENCING APPLICABLE TO ALL CONSTRUCTION PROJECTS:
 - 2.1. PERIMETER CONTROLS SHALL BE INSTALLED PRIOR TO EARTH DISTURBING ACTIVITIES. PERIMETER CONTROLS AND STABILIZED CONSTRUCTION EXITS SHALL BE INSTALLED AS SHOWN IN THE BMP MANUAL AND AS DIRECTED BY THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARER.
 - 2.2. EROSION, SEDIMENTATION CONTROL MEASURES AND INFILTRATION BASINS SHALL BE CLEANED, REPLACED AND AUGMENTED AS NECESSARY TO PREVENT SEDIMENTATION BEYOND PROJECT LIMITS THROUGHOUT THE PROJECT DURATION.
 - 2.3. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED IN ACCORDANCE WITH THE CONSTRUCTION GENERAL PERMIT AND SECTION 645 OF THE NHDOT SPECIFICATIONS FOR ROAD AND BRIDGES CONSTRUCTION.
 - 2.4. AN AREA SHALL BE CONSIDERED STABLE IF ONE OF THE FOLLOWING HAS OCCURRED:
 - (A) BASE COURSE GRAVELS HAVE BEEN INSTALLED IN AREAS TO BE PAVED;
 - (B) A MINIMUM OF 85% VEGETATED GROWTH HAS BEEN ESTABLISHED;
 - (C) A MINIMUM OF 3" OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIP-RAP HAS BEEN INSTALLED;
 - (D) TEMPORARY SLOPE STABILIZATION CONFORMING TO TABLE 1 HAS BEEN PROPERLY INSTALLED
 - 2.5. ALL STOCKPILES SHALL BE CONTAINED WITH A PERIMETER CONTROL. IF THE STOCKPILE IS TO REMAIN UNDISTURBED FOR MORE THAN 14 DAYS, MULCHING WILL BE REQUIRED.
 - 2.6. A WATER TRUCK SHALL BE AVAILABLE TO CONTROL EXCESSIVE DUST AT THE DIRECTION OF THE CONTRACT ADMINISTRATOR.
 - 2.7. TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL REMAIN UNTIL THE AREA HAS BEEN PERMANENTLY STABILIZED.
 - 2.8. CONSTRUCTION PERFORMED ANY TIME BETWEEN NOVEMBER 30th AND MAY 1st OF ANY YEAR SHALL BE CONSIDERED WINTER CONSTRUCTION AND SHALL CONFORM TO THE FOLLOWING REQUIREMENTS.
 - (A) ALL PROPOSED VEGETATED AREAS WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15th, OR WHICH ARE DISTURBED AFTER OCTOBER 15th, SHALL BE STABILIZED IN ACCORDANCE WITH TABLE 1.
 - (B) ALL DITCHES OR SWALES WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15th, OR WHICH ARE DISTURBED AFTER OCTOBER 15th, SHALL BE STABILIZED TEMPORARILY WITH STONE OR IN ACCORDANCE WITH TABLE 1.
 - (C) AFTER NOVEMBER 30th INCOMPLETE ROAD SURFACES, WHERE WORK HAS STOPPED FOR THE SEASON, SHALL BE PROTECTED IN ACCORDANCE WITH TABLE 1.
 - (D) WINTER EXCAVATION AND EARTHWORK SHALL BE DONE SUCH THAT NO MORE THAN 1 ACRE OF THE PROJECT IS WITHOUT STABILIZATION AT ONE TIME, UNLESS A WINTER CONSTRUCTION PLAN HAS BEEN APPROVED BY NHDOT THAT MEETS THE REQUIREMENTS OF ENV-WQ 1505.02 AND ENV-WQ 1505.05.
 - (E) A SWPPP AMENDMENT SHALL BE SUBMITTED TO THE DEPARTMENT, FOR APPROVAL, ADDRESSING COLD WEATHER STABILIZATION (ENV-WQ 1505.05) AND INCLUDING THE REQUIREMENTS OF NO LESS THAN 30 DAYS PRIOR TO THE COMMENCEMENT OF WORK SCHEDULED AFTER NOVEMBER 30th.
- GENERAL CONSTRUCTION PLANNING AND SELECTION OF STRATEGIES TO CONTROL EROSION AND SEDIMENT ON HIGHWAY CONSTRUCTION PROJECTS**
3. PLAN ACTIVITIES TO ACCOUNT FOR SENSITIVE SITE CONDITIONS:
 - 3.1. CLEARLY FLAG AREAS TO BE PROTECTED IN THE FIELD AND PROVIDE CONSTRUCTION BARRIERS TO PREVENT TRAFFICKING OUTSIDE OF WORK AREAS.
 - 3.2. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS.
 - 3.3. PROTECT AND MAXIMIZE EXISTING NATIVE VEGETATION AND NATURAL FOREST BUFFERS BETWEEN CONSTRUCTION ACTIVITY AND SENSITIVE AREAS.
 - 3.4. WHEN WORK IS PERFORMED IN AND NEAR WATER COURSES, STREAM FLOW DIVERSION METHODS SHALL BE IMPLEMENTED PRIOR TO ANY EXCAVATION OR FILLING.
 - 3.5. WHEN WORK IS PERFORMED WITHIN 50 FEET OF SURFACE WATERS (WETLAND, OPEN WATER OR FLOWING WATER), PERIMETER CONTROL SHALL BE ENHANCED CONSISTENT WITH SECTION 2.1.2.1. OF THE 2012 NPDES CONSTRUCTION GENERAL PERMIT.
 4. MINIMIZE THE AMOUNT OF EXPOSED SOIL:
 - 4.1. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS. MINIMIZE THE AREA OF EXPOSED SOIL AT ANY ONE TIME. PHASING SHALL BE USED TO REDUCE THE AMOUNT AND DURATION OF SOIL EXPOSED TO THE ELEMENTS AND VEHICLE TRACKING.
 - 4.2. UTILIZE TEMPORARY MULCHING OR PROVIDE ALTERNATE TEMPORARY STABILIZATION ON EXPOSED SOILS IN ACCORDANCE WITH TABLE 1.
 - 4.3. THE MAXIMUM AMOUNT OF DISTURBED EARTH SHALL NOT EXCEED A TOTAL OF 5 ACRES FROM MAY 1st THROUGH NOVEMBER 30th, OR EXCEED ONE ACRE DURING WINTER MONTHS, UNLESS THE CONTRACTOR DEMONSTRATES TO THE DEPARTMENT THAT THE ADDITIONAL AREA OF DISTURBANCE IS NECESSARY TO MEET THE CONTRACTORS CRITICAL PATH METHOD SCHEDULE (CPM), AND THE CONTRACTOR HAS ADEQUATE RESOURCES AVAILABLE TO ENSURE THAT ENVIRONMENTAL COMMITMENTS WILL BE MET.
 5. CONTROL STORMWATER FLOWING ONTO AND THROUGH THE PROJECT:
 - 5.1. DIVERT OFF SITE RUNOFF OR CLEAN WATER AWAY FROM THE CONSTRUCTION ACTIVITY TO REDUCE THE VOLUME THAT NEEDS TO BE TREATED ON SITE.
 - 5.2. DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM DISTURBED AREAS, SLOPES, AND AROUND ACTIVE WORK AREAS AND TO A STABILIZED OUTLET LOCATION.
 - 5.3. CONSTRUCT IMPERMEABLE BARRIERS AS NECESSARY TO COLLECT OR DIVERT CONCENTRATED FLOWS FROM WORK OR DISTURBED AREAS.
 - 5.4. STABILIZE, TO APPROPRIATE ANTICIPATED VELOCITIES, CONVEYANCE CHANNELS OR PUMPING SYSTEMS NEEDED TO CONVEY CONSTRUCTION STORMWATER TO BASINS AND DISCHARGE LOCATIONS PRIOR TO USE.
 - 5.5. DIVERT OFF-SITE WATER THROUGH THE PROJECT IN AN APPROPRIATE MANNER SO NOT TO DISTURB THE UPSTREAM OR DOWNSTREAM SOILS, VEGETATION OR HYDROLOGY BEYOND THE PERMITTED AREA.
 6. PROTECT SLOPES:
 - 6.1. INTERCEPT AND DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM UNPROTECTED AND NEWLY ESTABLISHED AREAS AND SLOPES TO A STABILIZED OUTLET OR CONVEYANCE.
 - 6.2. CONSIDER HOW GROUNDWATER SEEPAGE ON CUT SLOPES MAY IMPACT SLOPE STABILITY AND INCORPORATE APPROPRIATE MEASURES TO MINIMIZE EROSION.
 - 6.3. CONVEY STORMWATER DOWN THE SLOPE IN A STABILIZED CHANNEL OR SLOPE DRAIN.
 - 6.4. THE OUTER FACE OF THE FILL SLOPE SHOULD BE IN A LOOSE RUFFLED CONDITION PRIOR TO TURF ESTABLISHMENT. TOPSOIL OR HUMUS LAYERS SHALL BE TRACKED UP AND DOWN THE SLOPE, DISKED, HARROWED, DRAGGED WITH A CHAIN OR MAT, MACHINE-RAKED, OR HAND-WORKED TO PRODUCE A RUFFLED SURFACE.
 7. ESTABLISH STABILIZED CONSTRUCTION EXITS:
 - 7.1. INSTALL AND MAINTAIN CONSTRUCTION EXITS, ANYWHERE TRAFFIC LEAVES A CONSTRUCTION SITE ONTO A PUBLIC RIGHT-OF-WAY.
 - 7.2. SWEEP ALL CONSTRUCTION RELATED DEBRIS AND SOIL FROM THE ADJACENT PAVED ROADWAYS AS NECESSARY.
 8. PROTECT STORM DRAIN INLETS:
 - 8.1. DIVERT SEDIMENT LADEN WATER AWAY FROM INLET STRUCTURES TO THE EXTENT POSSIBLE.
 - 8.2. INSTALL SEDIMENT BARRIERS AND SEDIMENT TRAPS AT INLETS TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE SYSTEM.
 - 8.3. CLEAN CATCH BASINS, DRAINAGE PIPES, AND CULVERTS IF SIGNIFICANT SEDIMENT IS DEPOSITED.
 - 8.4. DROP INLET SEDIMENT BARRIERS SHOULD NEVER BE USED AS THE PRIMARY MEANS OF SEDIMENT CONTROL AND SHOULD ONLY BE USED TO PROVIDE AN ADDITIONAL LEVEL OF PROTECTION TO STRUCTURES AND DOWN-GRADIENT SENSITIVE RECEPTORS.
 9. SOIL STABILIZATION:
 - 9.1. WITHIN THREE DAYS OF THE LAST ACTIVITY IN AN AREA, ALL EXPOSED SOIL AREAS, WHERE CONSTRUCTION ACTIVITIES ARE COMPLETE, SHALL BE STABILIZED.
 - 9.2. IN ALL AREAS, TEMPORARY SOIL STABILIZATION MEASURES SHALL BE APPLIED IN ACCORDANCE WITH THE STABILIZATION REQUIREMENTS (SECTION 2.2) OF THE 2012 CGP. (SEE TABLE 1 FOR GUIDANCE ON THE SELECTION OF TEMPORARY SOIL STABILIZATION MEASURES.)
 - 9.3. EROSION CONTROL SEED MIX SHALL BE SOWN IN ALL INACTIVE CONSTRUCTION AREAS THAT WILL NOT BE PERMANENTLY SEEDED WITHIN TWO WEEKS OF DISTURBANCE AND PRIOR TO SEPTEMBER 15, OF ANY GIVEN YEAR, IN ORDER TO ACHIEVE VEGETATIVE STABILIZATION PRIOR TO THE END OF THE GROWING SEASON.
 - 9.4. SOIL TACKIFIERS MAY BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND REAPPLIED AS NECESSARY TO MINIMIZE SOIL AND MULCH LOSS UNTIL PERMANENT VEGETATION IS ESTABLISHED.
 10. RETAIN SEDIMENT ON-SITE AND CONTROL DEWATERING PRACTICES:
 - 10.1. TEMPORARY SEDIMENT BASINS (CGP-SECTION 2.1.3.2) OR SEDIMENT TRAPS (ENV-WQ 1506.10) SHALL BE SIZED TO RETAIN, ON SITE, THE VOLUME OF A 2-YEAR 24-HOUR STORM EVENT FOR ANY AREA OF DISTURBANCE OR 3,600 CUBIC FEET OF STORMWATER RUNOFF PER ACRE OF DISTURBANCE, WHICHEVER IS GREATER. TEMPORARY SEDIMENT BASINS USED TO TREAT STORMWATER RUNOFF FROM AREAS GREATER THAN 5-ACRES OF DISTURBANCE SHALL BE SIZED TO ALSO CONTROL STORMWATER RUNOFF FROM A 10-YEAR 24 HOUR STORM EVENT. ON-SITE RETENTION OF THE 10-YEAR 24-HOUR EVENT IS NOT REQUIRED.
 - 10.2. CONSTRUCT AND STABILIZE DEWATERING INFILTRATION BASINS PRIOR TO ANY EXCAVATION THAT MAY REQUIRE DEWATERING.
 - 10.3. TEMPORARY SEDIMENT BASINS OR TRAPS SHALL BE PLACED AND STABILIZED AT LOCATIONS WHERE CONCENTRATED FLOW (CHANNELS AND PIPES) DISCHARGE TO THE SURROUNDING ENVIRONMENT FROM AREAS OF UNSTABILIZED EARTH DISTURBING ACTIVITIES.

11. ADDITIONAL EROSION AND SEDIMENT CONTROL GENERAL PRACTICES:
 - 11.1. USE TEMPORARY MULCHING, PERMANENT MULCHING, TEMPORARY VEGETATIVE COVER, AND PERMANENT VEGETATIVE COVER TO REDUCE THE NEED FOR DUST CONTROL. USE MECHANICAL SWEEPERS ON PAVED SURFACES WHERE NECESSARY TO PREVENT DUST BUILDUP. APPLY WATER, OR OTHER DUST INHIBITING AGENTS OR TACKIFIERS, AS APPROVED BY THE NHDES.
 - 11.2. ALL STOCKPILES SHALL BE CONTAINED WITH TEMPORARY PERIMETER CONTROLS. INACTIVE SOIL STOCKPILES SHOULD BE PROTECTED WITH SOIL STABILIZATION MEASURES (TEMPORARY EROSION CONTROL SEED MIX AND MULCH, SOIL BINDER) OR COVERED WITH ANCHORED TARPS.
 - 11.3. EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSPECTED IN ACCORDANCE WITH SECTION 645 OF NHDOT SPECIFICATIONS, WEEKLY AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.25 IN. OF RAIN PER 24-HOUR PERIOD. EROSION AND SEDIMENT CONTROL MEASURES WILL ALSO BE INSPECTED IN ACCORDANCE WITH THE GUIDANCE MEMO FROM THE NHDES CONTAINED WITHIN THE CONTRACT PROPOSAL AND THE EPA CONSTRUCTION GENERAL PERMIT.
 - 11.4. THE CONTRACTOR SHOULD UTILIZE STORM DRAIN INLET PROTECTION TO PREVENT SEDIMENT FROM ENTERING A STORM DRAINAGE SYSTEM PRIOR TO THE PERMANENT STABILIZATION OF THE CONTRIBUTING DISTURBED AREA.
 - 11.5. PERMANENT STABILIZATION MEASURES WILL BE CONSTRUCTED AND MAINTAINED IN LOCATIONS AS SHOWN ON THE CONSTRUCTION PLANS TO STABILIZE AREAS. VEGETATIVE STABILIZATION SHALL NOT BE CONSIDERED PERMANENTLY STABILIZED UNTIL VEGETATIVE GROWTH COVERS AT LEAST 85% OF THE DISTURBED AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR EROSION AND SEDIMENT CONTROL FOR ONE YEAR AFTER PROJECT COMPLETION.
 - 11.6. CATCH BASINS: CARE SHALL BE TAKEN TO ENSURE THAT SEDIMENTS DO NOT ENTER ANY EXISTING CATCH BASINS DURING CONSTRUCTION. THE CONTRACTOR SHALL PLACE TEMPORARY STONE INLET PROTECTION OVER INLETS IN AREAS OF SOIL DISTURBANCE THAT ARE SUBJECT TO SEDIMENT CONTAMINATION.
 - 11.7. TEMPORARY AND PERMANENT DITCHES SHALL BE CONSTRUCTED, STABILIZED AND MAINTAINED IN A MANNER THAT WILL MINIMIZE SCOUR. TEMPORARY AND PERMANENT DITCHES SHALL BE DIRECTED TO DRAIN TO SEDIMENT BASINS OR STORM WATER COLLECTION AREAS.
 - 11.8. WINTER EXCAVATION AND EARTHWORK ACTIVITIES NEED TO BE LIMITED IN EXTENT AND DURATION, TO MINIMIZE POTENTIAL EROSION AND SEDIMENTATION IMPACTS. THE AREA OF EXPOSED SOIL SHALL BE LIMITED TO ONE ACRE, OR THAT WHICH CAN BE STABILIZED AT THE END OF EACH DAY UNLESS A WINTER CONSTRUCTION PLAN, DEVELOPED BY A QUALIFIED ENGINEER OR A CPESC SPECIALIST, IS REVIEWED AND APPROVED BY THE DEPARTMENT.
 - 11.9. CHANNEL PROTECTION MEASURES SHALL BE SUPPLEMENTED WITH PERIMETER CONTROL MEASURES WHEN THE DITCH LINES OCCUR AT THE BOTTOM OF LONG FILL SLOPES. THE PERIMETER CONTROLS SHALL BE INSTALLED ON THE FILL SLOPE TO MINIMIZE THE POTENTIAL FOR FILL SLOPE SEDIMENT DEPOSITS IN THE DITCH LINE.

BEST MANAGEMENT PRACTICES (BMP) BASED ON AMOUNT OF OPEN CONSTRUCTION AREA

12. STRATEGIES SPECIFIC TO OPEN AREAS LESS THAN 5 ACRES:
 - 12.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500: ALTERATION OF TERRAIN FOR CONSTRUCTION AND USE ALL CONVENTIONAL BMP STRATEGIES.
 - 12.2. SLOPES STEEPER THAN 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING.
 - 12.3. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT ALONE.
 - 12.4. AREAS WHERE HAUL ROADS ARE CONSTRUCTED AND STORMWATER CANNOT BE TREATED THE DEPARTMENT WILL CONSIDER INFILTRATION.
 - 12.5. FOR HAUL ROADS ADJACENT TO SENSITIVE ENVIRONMENTAL AREAS OR STEEPER THAN 5%, THE DEPARTMENT WILL CONSIDER USING EROSION STONE, CRUSHED GRAVEL, OR CRUSHED STONE BASE TO HELP MINIMIZE EROSION ISSUES.
 - 12.6. ALL AREAS THAT CAN BE STABILIZED SHALL BE STABILIZED PRIOR TO OPENING UP NEW TERRITORY.
 - 12.7. DETENTION BASINS SHALL BE DESIGNED AND CONSTRUCTED TO ACCOMMODATE A 2 YEAR STORM EVENT.
13. STRATEGIES SPECIFIC TO OPEN AREAS BETWEEN 5 AND 10 ACRES:
 - 13.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES WILL BE UTILIZED.
 - 13.2. DETENTION BASINS WILL BE CONSTRUCTED TO ACCOMMODATE THE 2-YEAR 24-HOUR STORM EVENT AND CONTROL A 10-YEAR 24-HOUR STORM EVENT.
 - 13.3. SLOPES STEEPER THAN A 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS. OTHER ALTERNATIVE MEASURES, SUCH AS BONDED FIBER MATRICES (BFMS) OR FLEXIBLE GROWTH MEDIUMS (FGMS) MAY BE UTILIZED, IF MEETING THE NHDES APPROVALS AND REGULATIONS.
 - 13.4. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS.
14. STRATEGIES SPECIFIC TO OPEN AREAS OVER 10 ACRES:
 - 14.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WQ 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES AND BETWEEN 5 AND 10 ACRES WILL BE UTILIZED.
 - 14.2. THE DEPARTMENT ANTICIPATES THAT SOIL BINDERS WILL BE NEEDED ON ALL SLOPES STEEPER THAN 3:1, IN ORDER TO MINIMIZE EROSION AND REDUCE THE AMOUNT OF SEDIMENT IN THE STORMWATER TREATMENT BASINS.
 - 14.3. THE CONTRACTOR WILL BE REQUIRED TO HAVE AN APPROVED DESIGN IN ACCORDANCE WITH ENV-WQ 1506.12 FOR AN ACTIVE FLOCCULANT TREATMENT SYSTEM TO TREAT AND RELEASE WATER CAPTURED IN STORM WATER BASINS. THE CONTRACTOR SHALL ALSO RETAIN THE SERVICES OF AN ENVIRONMENTAL CONSULTANT WHO HAS DEMONSTRATED EXPERIENCE IN THE DESIGN OF FLOCCULANT TREATMENT SYSTEMS. THE CONSULTANT WILL ALSO BE RESPONSIBLE FOR THE IMPLEMENTATION AND MONITORING OF THE SYSTEM.

**TABLE 1
GUIDANCE ON SELECTING TEMPORARY SOIL STABILIZATION MEASURES**

APPLICATION AREAS	DRY MULCH METHODS				HYDRAULICALLY APPLIED MULCHES ²				ROLLED EROSION CONTROL BLANKETS ³			
	HMT	WC	SG	CB	HM	SMM	BFM	FRM	SNSB	DNSB	DNSCB	DNCB
SLOPES¹												
STEEPER THAN 2:1	NO	NO	YES	NO	NO	NO	NO	YES	NO	NO	NO	YES
2:1 SLOPE	YES ¹	YES ¹	YES	YES	NO	NO	YES	YES	NO	YES	YES	YES
3:1 SLOPE	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	NO
4:1 SLOPE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
WINTER STABILIZATION	4T/AC	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES
CHANNELS												
LOW FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES
HIGH FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES

ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE
HMT	HAY MULCH & TACK	HM	HYDRAULIC MULCH	SNSB	SINGLE NET STRAW BLANKET
WC	WOOD CHIPS	SMM	STABILIZED MULCH MATRIX	DNSB	DOUBLE NET STRAW BLANKET
SG	STUMP GRINDINGS	BFM	BONDED FIBER MATRIX	DNSCB	2 NET STRAW-COCONUT BLANKET
CB	COMPOST BLANKET	FRM	FIBER REINFORCED MEDIUM	DNCB	2 NET COCONUT BLANKET

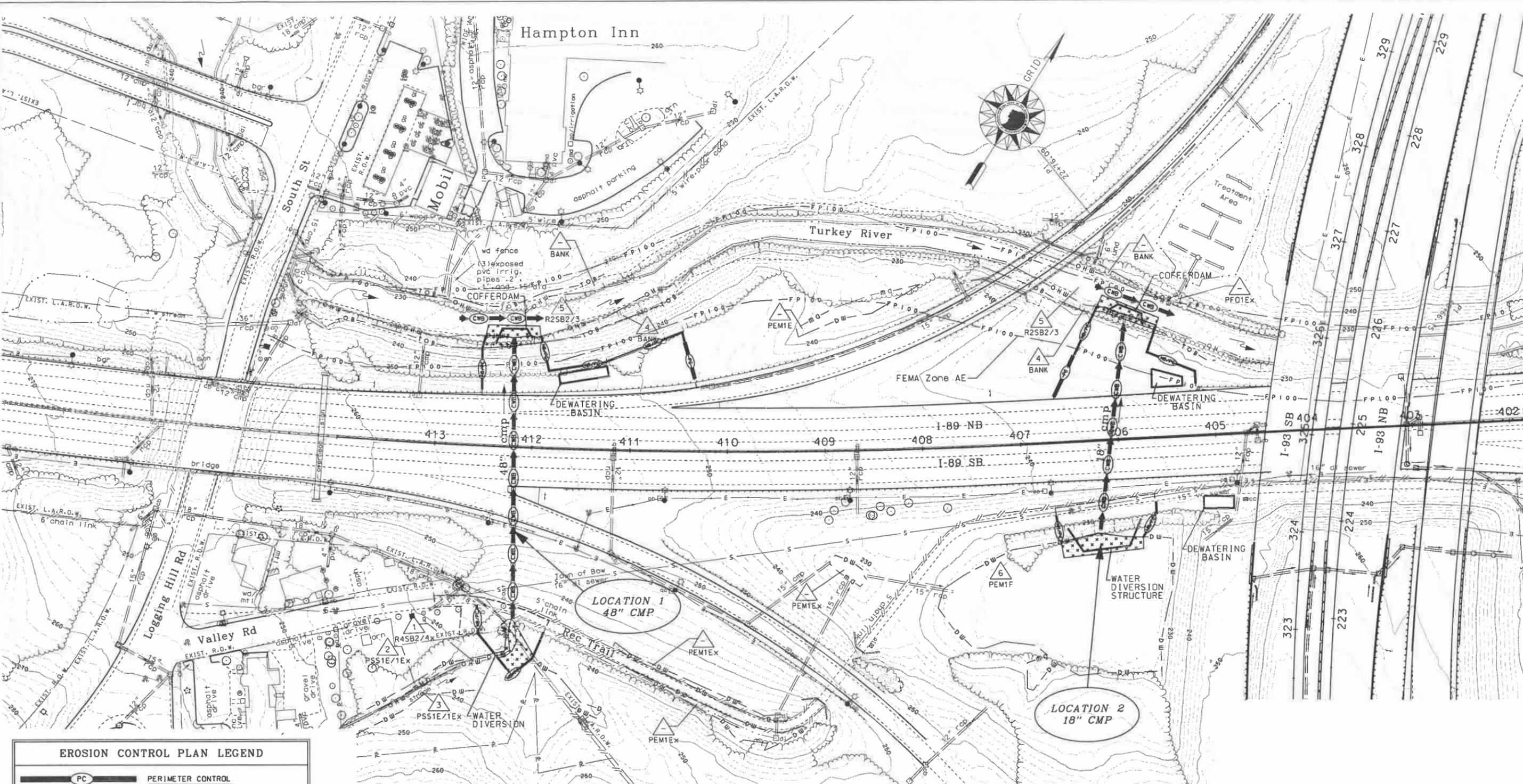
- NOTES:
1. ALL SLOPE STABILIZATION OPTIONS ASSUME A SLOPE LENGTH ≤10 TIMES THE HORIZONTAL DISTANCE COMPONENT OF THE SLOPE, IN FEET.
 2. PRODUCTS CONTAINING POLYACRYLAMIDE (PAM) SHALL NOT BE APPLIED DIRECTLY TO OR WITHIN 100 FEET OF ANY SURFACE WATER WITHOUT PRIOR WRITTEN APPROVAL FROM THE NH DEPARTMENT OF ENVIRONMENTAL SERVICES.
 3. ALL EROSION CONTROL BLANKETS SHALL BE MADE WITH WILDLIFE FRIENDLY BIODEGRADABLE NETTING.

STATE OF NEW HAMPSHIRE
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EROSION CONTROL STRATEGIES

REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
12-21-2015	42704erosstrat	42704	9	10

SDR PROCESSED	DATE	3/2021
NEW DESIGN	DATE	3/2021
SHEET CHECKED	DATE	5/5/21
AS BUILT DETAILS	DATE	



EROSION CONTROL PLAN LEGEND	
	PERIMETER CONTROL SILT FENCE EROSION CONTROL MIX BERM EROSION CONTROL MIX SOX TURBIDITY CURTAIN SHEET PILE COFFER DAM
	NATURAL BUFFER/PERIMETER CONTROL SILT FENCE EROSION CONTROL MIX BERM EROSION CONTROL MIX SOX TURBIDITY CURTAIN SHEET PILE COFFER DAM
	CHANNEL PROTECTION STONE CHECK DAMS STRAW WATTLES CHANNEL MATTING CLASS D EROSION STONE CLASS C STONE
	CLEAN WATER BYPASS PUMP THROUGH PIPE DRAIN THROUGH PIPE OR CHANNEL

COFFERDAM, WATER DIVERSION, AND DEWATERING BASIN SIZES AND LOCATIONS ARE APPROXIMATE. FINAL TYPE/SIZE/LOCATION SHALL BE AS PER CONTRACTOR'S APPROVED SWPPP.

EXISTING RIPRAP IN TURKEY RIVER NOT SHOWN FOR CLARITY OF PLANS. SEE SHEETS 5 AND 6 FOR LIMITS OF EXISTING RIPRAP.

NO CHANGE TO EXISTING TOPOGRAPHY, NO PROPOSED CONTOURS.



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EROSION CONTROL PLAN			
DGN 42704ercplans	STATE PROJECT NO. 42704	SHEET NO. 10	TOTAL SHEETS 10